FINAL SUBMITTAL

ENERGY ENGINEERING ANALYSIS PROGRAM

LIMITED ENERGY STUDY

WATERVLIET ARSENAL

WATERVLIET, NEW YORK

VOLUME IV

PROGRAMMING DOCUMENTS

CONTRACT NO. DACA65-91-C-0072

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS
NORFOLK, VIRGINIA

PREPARED BY:

REYNOLDS, SMITH AND HILLS, INC.
ENERGY AND ENVIRONMENTAL SERVICES DEPARTMENT
P.O. BOX 4850
JACKSONVILLE, FLORIDA 32201

PROJECT NO. 2900379002

AUGUST 1992

8/92

PROGRAMMING DOCUMENTS

VOLUME IV

TABLE OF CONTENTS

DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

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Marie Wakefield,
Librarian Engineering

QRIP

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.

REQUIREMENT CONTROL SYMBOL
DD-M(R) 1561

2. TO:
CDR, AMC (AMCRM-MP)
5001 Eisenhower Avenue
Alexandria, VA 22333-0001

3. THRU:

4. FROM:
CDR, AMCCOM
Attn: AMSMC-MGP-P (R)
Rock Island, IL 61299-6000

5. DOD COMP NAME: Army

6. DOD COMP CODE: A

7. COMMAND CODE: W73QKK

8. DATE:

9. PROJECT TITLE
Condensate Return--Building 35 Plating Areas (ECO #6)

10. TYPE OF PROJECT *(Check one)*
[X] QRIP [ ] OSD PIF [ ] PECIP

11. AMORTIZATION YEARS/MONTHS
$ 17,700 *(Project Cost)* ÷ 23,300 *(Average Annual Savings)* x 12 *(No. Mos)*
= 0.76 *(years)* or _____ *(months)* *(amortization)*

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR
024

13. ECONOMIC LIFE
25 years

14. EXPECTED OPERATIONAL DATE

15. SUBMITTING UNIT(S)
Commander
Watervliet Arsenal
Attn: SMCWV-FE
(W. Face)
Building 120
Watervliet, NY 12189

16. UNIT ID CODE
WOK9AA

17. PROJECT DESCRIPTION
Install piping to return condensate from the plating areas in Building 35. pH sensors are used to divert the condensate to waste if contamination occurs.

18. DETAILED JUSTIFICATION
Returning 180°F condensate to the boilers will reduce the energy used that is presently used to heat 60°F make-up water to steam conditions.

19. SAVINGS DISPOSITION
Savings are used to reduce energy expenditures.

20. OTHER REMARKS *(Continue on page 5, if more space is needed)*

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. **SUMMARY OF DOLLAR SAVINGS**
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* Nat gas & #6 FO	$245,000	$221,700	$221,700	$221,700	$221,700	$23,300	$23,300	$23,300	$23,300
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	**$245,000**	**$221,700**	**$221,700**	**$221,700**	**$221,700**	**$23,300**	**$23,300**	**$23,300**	**$23,300**

b. **PRIORITIZATION**

(1) **INTERNAL RATE OF RETURN** *(IRR)*

Divide estimated project cost $17,700 by average annual savings $23,300 = 0.76 factor. Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 300+ % IRR.

(2) **SAVINGS TO INVESTMENT RATIO (S/I)**

Multiply annual savings $23,300 X discount factor 9.524 = 221,909 and divide by present value of investment *(undiscounted)* 17,700 = 12.5 *S/I.*

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) **RATE OF INVESTMENT PER MANPOWER SPACE** *(RIMS)*

Divide estimated project cost -- by number of manpower space savings -- = -- RIMS. *(Manpower requirements cannot be used in this computation.)*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1) Condensate Return System piping, valves, controls		$17,700		$17,700		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION *(Equipment delivery)*						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER *(Specify):*						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$17,700		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$17,700		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]				--		
(16) TOTAL *(Sum of (14) + (15) above)*				$17,700		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*
[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*
[3] *Normally not OPA funded.*
[4] *Used to compute amortization in Item 11.*
[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS *a*	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR *b*	TYPE PERS[6] *c*	DOLLARS *d*	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
				e. FROM	*f.* TO	*g.* FROM	*h.* TO	*i.* FROM	*j.* TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower), e.g.,* CONTRACT COSTS & UTILITIES			$23,300						
(8)									
(9)									
(10)									
(11) **TOTAL DOLLAR SAVINGS**			**$23,300**						

6
(1) US Graded
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7]*Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--Continued.

24.	REGULATORY APPROVAL/COORDINATION	
a.	INVESTMENT STATEMENT	
This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints.		
(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)		
b. **OTHER COORDINATION** *(Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)*		
25. SUBMITTED BY *(Typed name, grade and title of Subordinate Command/Agency or Project Initiator)*	**SIGNATURE**	**DATE** *(YYMMDD)* **AUTOVON**
26. APPROVAL RECOMMENDED BY *(MACOM/Agency)*	**SIGNATURE**	**DATE** *(YYMMDD)* **AUTOVON**
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		
27. APPROVED BY	**SIGNATURE**	**DATE** *(YYMMDD)* **AUTOVON**
20. OTHER REMARKS *(Cont'd)*		

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)–(Continued).

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SUBJECT ECO #6 - Plating Area Condensate Return
AEP NO 290-0379-0C
SHEET ____ OF ____
DESIGNER P. Hutchins
DATE 7/11/91
CHECKER B. Todd
DATE 9/16/91

ECO#6 - PLATING AREA CONDENSATE RETURN

- Estimate existing energy use for making steam

FY 90

BLDG 136 - 278,000 MBTU FSR

BLDG 35 - 29,500 MBTU NG&S

- Calculate total steam generated

Stm = FUEL USE * BLR EFF (App B, p. I-11)

	BLR EFF	MBTU	#
BLDG 136	0.83	230,700	232,133,000
BLDG 35	0.77	22,700	22,852,000

- Estimate condensate to be returned from plating area

Since Bldg 35 boiler supplies only the plating areas and no condensate is returned, the steam production during the summer months will be a good approximation for year-round use.

Average steam production for Aug and Sept '90

(3,676,600 + 3,983,500) / 2 ≈ 3,830,000 #/mon

Plating area annual steam use is ⇒ 3,830,000 * 12 ≈ 45,960,000 #/yr

≈ 46,000 MBTU/yr

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SUBJECT ECO #6

AEP NO

SHEET OF

DESIGNER

DATE 7/11/91

CHECKER

DATE

- Calculate energy savings by returning plating area condensate

Assume 90% is returned at 180°F to Bldg 35 and 150°F to Bldg 136.

$$\text{Fuel Energy Saved} = \frac{\text{condensate amount} * (\text{cond. temp} - \text{make-up temp.})}{\text{BOILER EFF}}$$

Bldg 35 $\Rightarrow$ $\frac{22{,}852{,}000^{\#} * (180-60)^{\circ}F * 1\ \frac{BTU}{1\,b^{\circ}F} * 0.9}{0.77}$

$= 3205$ MBTU Natural gas

Bldg 136 $\Rightarrow$ $\frac{(45{,}960{,}000 - 22{,}852{,}000) * (150-60) * 0.9}{0.83}$

$= 2255$ MBTU #6 Fuel Oil

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SUBJECT ECO #6 AEP NO

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QRIP Calc.s

- Calculate present, proposed and savings costs

Present annual energy use to Bldg. 35 plating is estimated using natural gas use at donkey boiler in Bldg #35

	Steam (lbs)	Steam (MBTU)	Nat. Gas (MCF)	Nat. Gas (MBtu)
June '90	4,110,000	4110	51,373	5291
July '90	2,572,000	2572	32,494	3347
Aug. '90	3,676,000	3676	46,329	4772
Sept. '90	3,984,000	3984	49,696	5119
Oct. '90	3,155,000	3155	37,780	3891

Using Aug and Sept as avg., monthly use is:

steam = $\frac{3676 + 3984}{2}$ = 3830 MBTU/mon.

N. gas = $\frac{4772 + 5119}{2}$ = 4946 MBTU/mon.

Annual Ngas = 4946 $\frac{MBTU}{mon}$ * 5 mos * $\frac{\$4.16}{MBTU}$ = $102,700

Annual #6 Fuel Oil = 3830 $\frac{MBTU}{mon}$ ÷ 0.83 * 7 mos * $\frac{\$4.40}{MBTU}$ = $142,100

TOTAL ENERGY COST = $245,000

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- Cost of proposed method

NGas = $(4946 * 5 - 3205) * 4.16 =$ $89,500

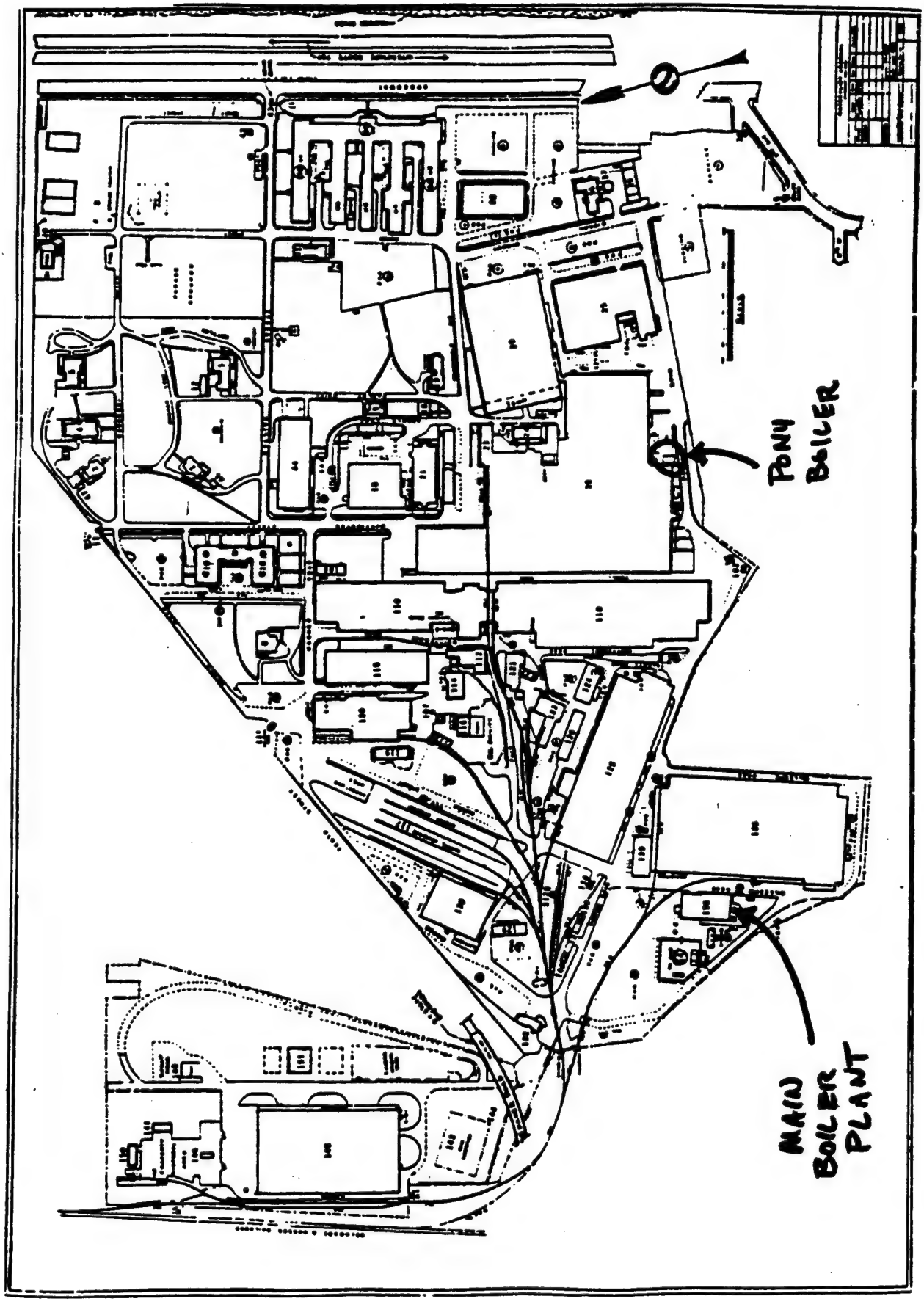
#6 Fuel Oil - $\frac{(3830 * 7 - 2255)}{0.83} * 4.40 =$ $132,200

Total $221,700

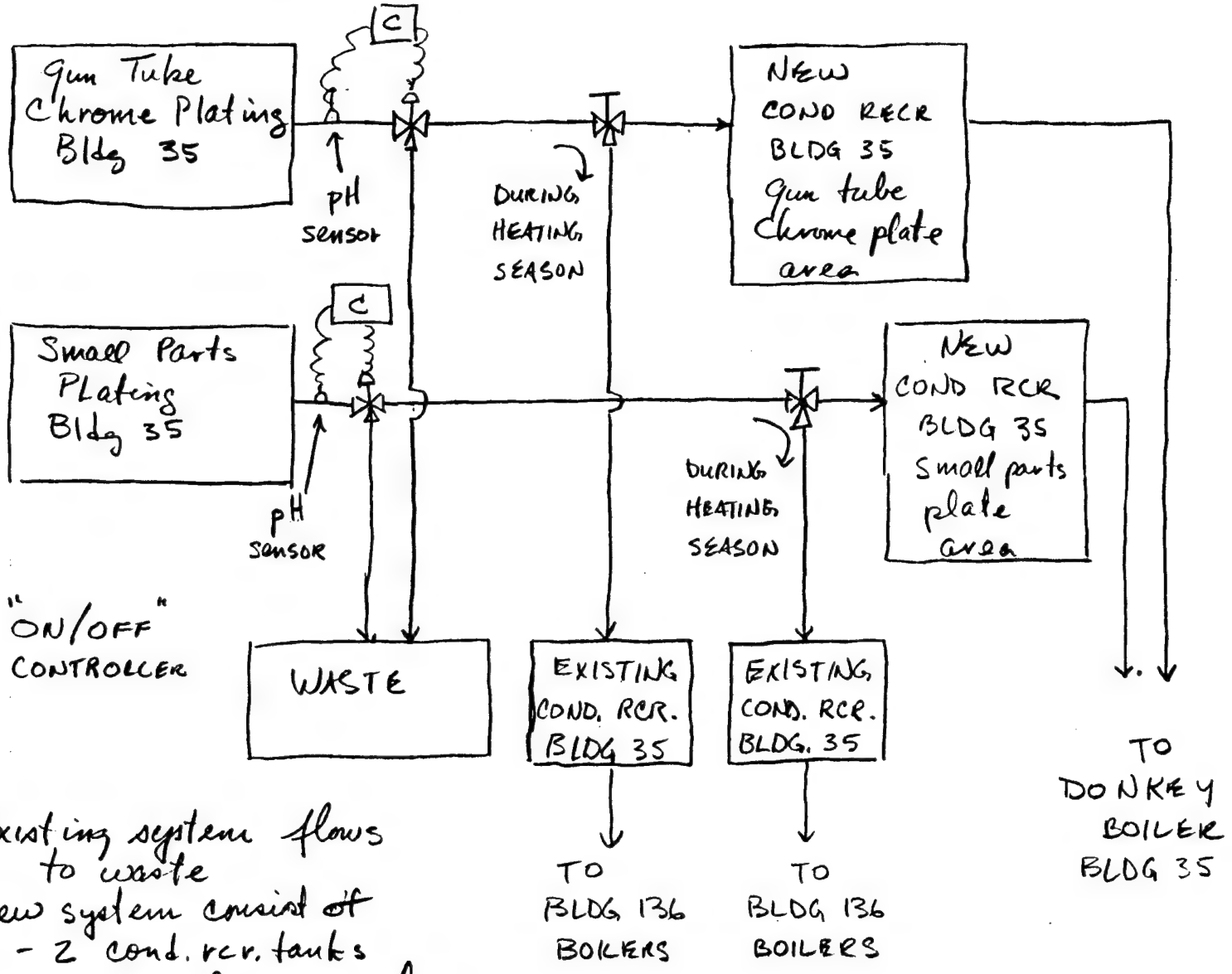
- Savings, annual

$245,000
- 221,700

$23,300


PONY
BOILER
MAIN
BOILER
PLANT

CONDENSATE RETURN SYSTEM SCHEMATIC



- Existing system flows to waste
- New system consist of
  - 2 cond. rcr. tanks
  - 2 manual 3-way values
  - 2 pH sensors and controls for 2 motorized 3-way values

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SUBJECT

DESIGNER P. Hutchins

CHECKER

AEP NO

SHEET OF

DATE

DATE

6-6

02/05/92

ECO Construction Cost Estimate
Calculations

ECO Name: PLATING AREA STEAM CONDENSATE RETURN

ECO #: 6

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$6,370
Labor	$4,040
Subtotal bare costs	$10,410
FICA Insurance (20% of Labor)	$808
Sales Tax (not applicable for GOGO)	$0
Subtotal	$11,218
Overhead (15%)	$1,683
Subtotal	$12,901
Profit (10%)	$1,290
Subtotal	$14,191
Bond (1%)	$142
Subtotal	$14,333
Contingency (10%)	$1,433
Subtotal (Construction Cost Input For LCCID *)	$15,766
SIOH (6% of Construction Cost)	$946
Subtotal	$16,712
Design (6% of Construction Cost)	$946
Total Project Cost	$17,658

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE	DATE PREPARED 8/7/91	SHEET OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: WATERVLIET ARSENAL

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify) _____

DRAWING NO.

ESTIMATOR: P. Hutchins

CHECKED BY

ECO # 6 SUMMARY
CONDENSATE RETURN

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
1" steel pipe, threaded, black, with couplings and hangars 10' O.C	800	ft	3.84	3070	1.49	1190	4260
Condensate Return Sys. Simplex, motor, float switch, controls, cast iron receiver	2	ea	365	730	955	1910	2640
pH Controllers	2	ea	25	50	650	1300	1350
Electrodes (sensors)	2	ea	25	50	250	500	550
3-WAY VALVE WITH ACTUATOR	2	ea	25	50	600	1200	1250
3-WAY VALVE, MANUAL	2	ea	25	50	125	250	270
WIRING	2	CLF	20	40	10	20	60
				4040		6370	10,380

ENG FORM 150
1 AUG 59

(ER 1110-345-730)

PREVIOUS EDITION MAY BE USED

* U.S. GOVERNMENT PRINTING OFFICE : 1990 0—516148

(TRANSLUCENT)

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SUBJECT ECO # 6
COST ESTIMATE BACKUP

AEP NO

SHEET OF

DESIGNER

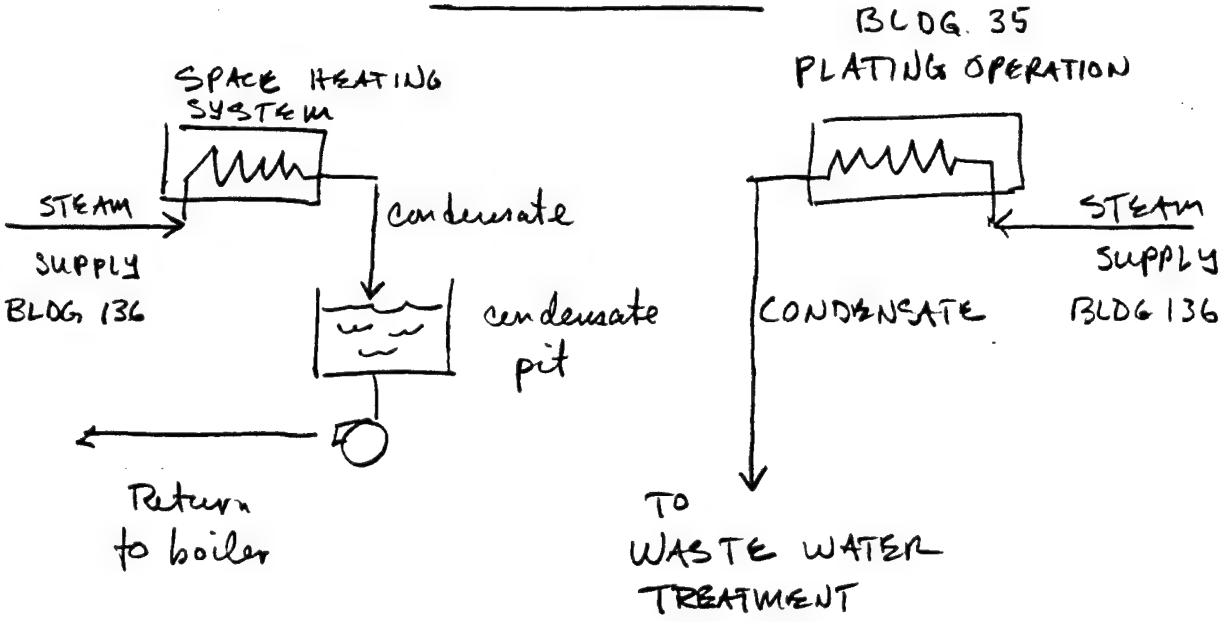
DATE

CHECKER

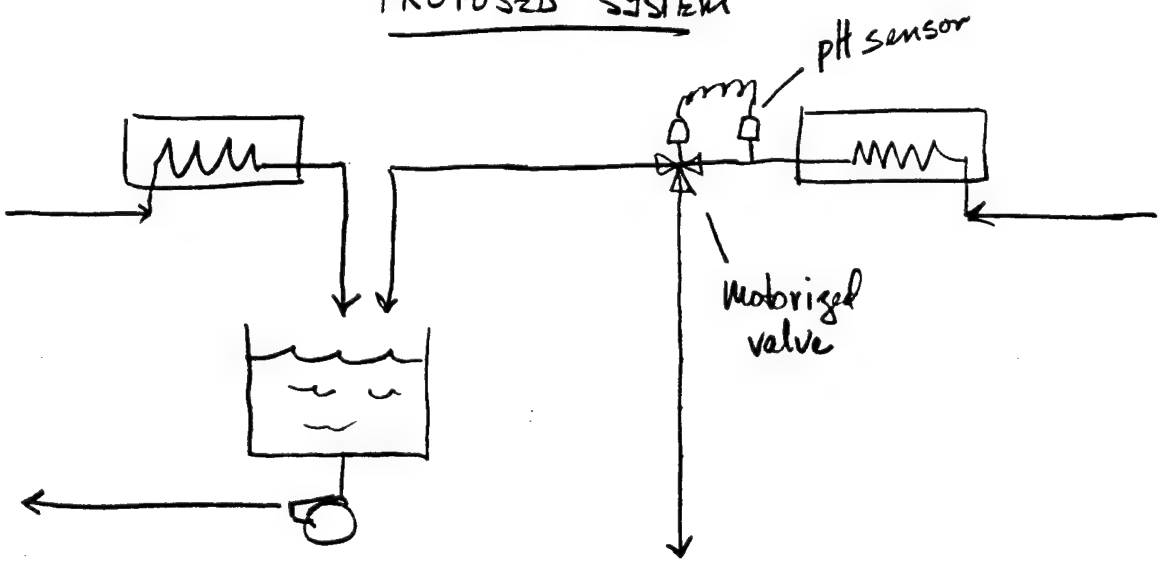
DATE

Non-Summer Operation – Condensate return to Bldg 136

EXISTING SYSTEMS



PROPOSED SYSTEM



- The proposed system will require piping between the existing plating system condensate lines and the condensate pit, a motorized valve, pH sensor and associated controls. The pH sensor is used to divert the condensate to waste when the pH drops below a preset value.

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SUBJECT ECO #6 AEP NO

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Summer Operation - Condensate return to Bldg 35 boiler

Since the Bldg. 35 boiler has no condensate return system, it will require all items mentioned earlier for Bldg 136 condensate return plus:

- condensate pit
- condensate pump
- pit/pump controls
- piping from pit pump to boiler

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SUBJECT ECO # 6 AEP NO

SHEET OF

DESIGNER P. Hutchins DATE 8/7/91

CHECKER DATE

- Determine condensate return requirements for donkey boiler from Bldg 35 plating areas
- Calculate condensate return pipe size

Ref.: "Flow of Fluids", Crane, 1979, p. 3-6,7

- Reasonable velocities are:

Boiler Feed	8 to 15 fps
General Service	4 to 10 fps

The steam flow is ~ 7000 lbs/hr

The water density @ 200F is 60.1 lbs/cf

$$7000 \frac{lbs}{hr} \cdot \frac{cf}{60.1\ lbs} \cdot \frac{hr}{3600\ sec} = 0.032 \frac{cf}{sec}$$

To keep the flow around 10 fps the pipe diameter should be

$$0.032 \frac{ft^3}{sec} \cdot 7.5 \frac{gal}{ft^3} \cdot 60 \frac{s}{min} = 14.4 gpm$$

$$Q = VA$$
$$A = Q/V$$
$$A = \pi D^2/4$$
$$\pi D^2/2 = Q/V$$

$$D = \sqrt{\frac{4Q}{\pi V}} = \sqrt{\frac{4\left(0.032 \frac{cf}{sec}\right)}{3.14 * 10 \frac{ft}{sec}}}$$

$$= 0.064 ft = 0.77 inches$$

or

3/4" pipe

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SUBJECT ECO #6 AEP NO

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- Calculate condensate return pump size

Using Bernoulli's Eqn.

$$H = 144\,\frac{P_2 - P_1}{\rho} + \frac{V_2^2 - V_1^2}{2g} + Z_2 - Z_1 + h_f$$

where H = total head (ft)
P_1 = pressure at ① (psig)
P_2 = pressure at ② (psig)
ρ = density of water @ 200°F (lbs/cf)
$Z_{1,2}$ = elevations at ①, ②
h_f = friction loss (ft)

Pumping will be from the gun tube chrome plate area condensate tank to the pony boiler located due east of this area and outside of the buildings.

$P_1 = P_2$ = atmospheric pressure (pumping from one tank to another)

$V_1 = V_2 = 0$

$H = Z_2 - Z_1 + h_f$

$h_f = f\,\frac{L}{D}\,\frac{V^2}{2g}$

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SUBJECT ECO#6 AEP NO

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- Calculate f, friction factor

f is read from the Moody friction factor chart

knowing the Reynolds number and ϵ/D

where $\epsilon = 0.0002$ for steel pipe

$$\epsilon/D = \frac{0.0002}{0.0687'} = 0.0029$$

$$N_{RE} = \frac{DV}{\nu} = \frac{0.0687 ft \cdot 10 ft/sec}{0.341E-5 ft^2/sec} =$$

$$= 2.01E5$$

For $\epsilon/D = 0.0029$ and $N_{RE} = 2.01E5$, $f = 0.0265$

$$h_f = 0.0265 \frac{300 ft}{0.0687 ft} \frac{(10 ft/sec)^2}{2 (32.2 ft/sec^2)}$$

$h_f = 180$ feet

$z_2 = -30$ feet

$H = -30 + 180 = 150$ ft

$$bhp = \frac{Q H}{3960 \eta_p}$$

where Q = gal/min H = head in ft η_p = pump eff

$$= \frac{14.4 \cdot 150}{3960 (0.7)} = 0.78 hp - use \underline{1 hp pump}$$

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For return from the small parts plating area

$$H = z_2 - z_1 + h_f$$

$$z_2 - z_1 = 0$$

$$h_f = f \frac{L}{D} \frac{V^2}{2g} = 0.0265 \frac{300}{0.0687} \frac{10^2}{2 \cdot 32.2}$$

$$h_f = 180 \text{ ft}$$

$$bhp = \frac{14.4 \cdot 180}{3960\ (.7)} = 0.9 \text{ hp}$$ use 1 hp pump

Summary

Use 1" schedule 40 pipe - 600 ft
due to sensor requirements
and 2, 1 hp pumps

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SUBJECT ECO #6 AEP NO

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- Determine equipment requirements for returning condensate from Bldg 35 plating areas to the Main Boiler Plant

Since condensate from the steam space heating system is already returned, the only requirements will be piping from the proposed receivers for returning condensate to the donkey boiler

Include 100' of 3/4" pipe plus valves

- Summarize total system requirements

The schematic on the following page shows the proposed condensate return system. pH sensors are use to divert condensate to waste drain if pH falls below a preset level, indicating acid contamination from plating areas. Otherwise, condensate flows to Bldg 136 during heating season and Bldg 35 donkey boiler during non-heating times.

HERMAN GOLDNER COMPANY, INCORPORATED
7777 BREWSTER AVE., PHILADELPHIA, PA 19153
215-365-6400 FAX: 215-365-6550

QUOTATION

TO: REYNOLDS SMITH + HILLS
JACKSONVILLE, FL

ATTN MR PAUL HUTCHINS

DATE: 8/9/91

YOUR INQUIRY: CONDENSATE DIVERTING VALVES

GENTLEMEN:

WE HEREBY SUBMIT OUR QUOTATION WHICH IS SUBJECT TO IMMEDIATE ACCEPTANCE.

ITEM NO.	QUANTITY	DESCRIPTION	NET UNIT PRICE	TOTAL
		FOR CONDENSATE SERVICE AT 25 PSIG @ 200°F.		
A	1	1" WORCESTER #D-446TTSEVI DIVERTING BALL VALVE, CS BODY, 1" NPT(F), 316 TRIM, TEFLON SEATS + SEALS, Cv 10, ASSEMBLED WITH RCS #MAR25-10-4 ELECTRIC ACTUATOR, N7, 115VAC, 0.75AMP LOCKED ROTOR DRAW, 2 EXTRA SWITCHES	$602.10	
B	2	1" WORCESTER #D-446TTSEVI DIVERTING BALL VALVE S/A ABOVE EXCEPT WITH MANUAL LEVER 90°	123.70	

DELIVERY: 3 wks

F.O.B. PHILA

PRICES IN EFFECT AT TIME OF SHIPMENT WILL APPLY.

TERMS: 2% ~~10TH AND 26TH~~ NET 30 UNLESS OTHERWISE INDICATED

HERMAN GOLDNER CO., INC.

PER Bill Neff

OMEGA
An OMEGA Technologies Company

SPEC SHEET
PHCN-28

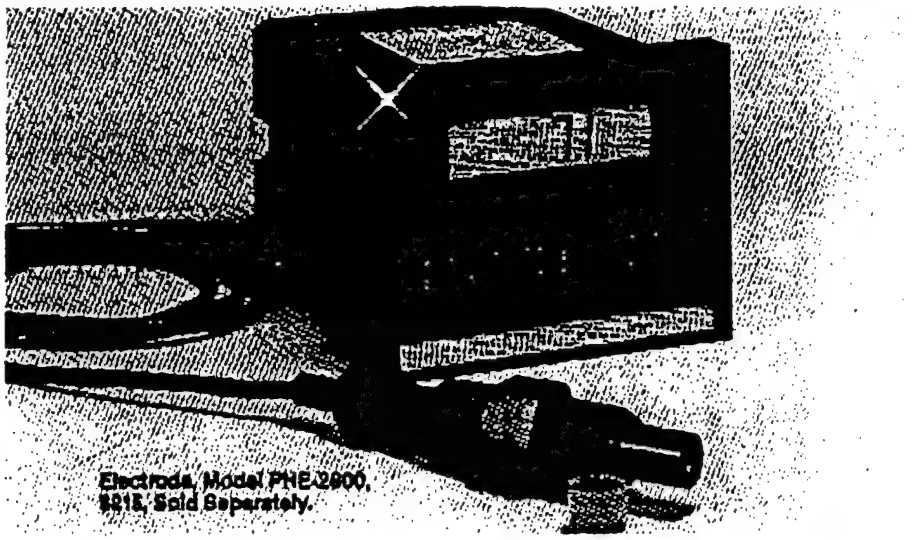
Versatile Microprocessor-Based pH Controller

From
$625

- Compact NEMA-4X Polycarbonate Enclosure
- Two Independently Adjustable Alarm Contacts with Adjustable Deadband
- Choice of 4-20 mA dc or RS232C Output
- Auto Calibration, Dual Point or "Grab Sample"
- 10 Self Diagnostic Functions
- Direct or Reverse Analog Output with Span From 0.1 to 20 pH Units
- CSA Approved

The OMEGA PHCN-28 microprocessor pH controller features auto buffering, solution temperature compensation, self-diagnostics and communication capabilities. Designed with the end-user in mind, this controller is user friendly and easy to operate. Four tactile membrane keypads allow for the selection and input of set-up parameters, input of calibration data and alarm setpoint adjustments. The two 5 A, 230 Vac relays can be configured as high/low, high/high or low/low.

The PHCN-28 is offered with a choice of an isolated 4-20 or 0-20 mA dc output (field selectable) or an RS232C interface with a non-isolated 0-5 V analog output. The analog output is flexible enough to be used as either a proportional control output or recorder output. The self-diagnostics of the PHCN-28 can alert the user to such conditions as internal circuitry malfunction, pH out of range, pH slope out of normal range, ATC short or open, or electrode failure to stabilize in buffer.


Electrode, Model PHE-2800, $215, Sold Separately.

The PHCN-28 has an integral pre-amplifier and is designed for use with the PHE-2800 gel filled, double junction combination electrode with ATC. For locations where the electrode and controller must be separated by more than 50 ft, the PHCN-28-PA external pre-amplifier should be considered. The unit features a rugged NEMA-4X polycarbonate enclosure. If an application requires an electrode other than the PHE-2800, then the PHCN-28-PA must be used. In this case a Pt100 is necessary for ATC.

SPECIFICATIONS

Ranges: −4 to 16 pH, −100 to 200°C
Resolution: 0.01 pH, 0.1°C
Temperature Compensation: Automatic
0 to 100°C, Pt100 ohm RTD
pH Accuracy: ±0.02 pH over range, −4 to 16 pH
Temp Accuracy: ±0.25°C over 0 to 100°C
Stability: ±0.01 pH, ±1 mV ORP over 30 days non-cumulative
Sensitivity: ±0.01 pH, ±1 mV ORP
Repeatibility: ±0.01 pH, ±1 mV ORP
Ambient Temperature Coefficient: ±0.002 pH/°C
Power Input: 120 V 50/60 Hz 8 Watts, 240 V 50/60 Hz 8 Watts, jumper selectable (requires fuse change)
Outputs: 4-20 mA dc isolated, RS232C with 0-5 V non-isolated
Output Span: Any 0.1 to 20 pH span (0.1 pH increments) selectable reverse or direct acting
Alarms: 2 SPST electromechanical relays rated 5 A 230 Vac, resistive load; supplied as normally open; alarms can be configured H/H, H/L, L/L; alarm deadband fully adjustable over pH span
Dimensions: 4.45"H × 5.75"W × 6.95"D (113 x 146 x 177 mm)
Weight: 3 lbs (1.35 kg)

5 YEAR WARRANTY

MADE IN [redacted]

CSA

To Order (Specify Model No.)		
Model No.	**Price**	**Description**
PHCN-28	~~$625~~	pH controller w/isolated 4-20 or 0-20 mA dc output
PHCN-28-D	~~730~~ 760	pH controller w/RS232C interface and 0-5 V analog output (software available)
PHE-2800	~~215~~ ~~235~~ 250	Combination gel filled, double junction electrode w/ATC (integral Pt100); Kynar body construction; 1" MNPT connections at both ends for insertion or submersion, max pressure 100 PSIG at 65°C. Overall electrode length 5.67", insertion length 2.52"
PHCN-28-PA	~~319~~ 365	Pre-amplifier for distances > 50 ft or for use w/electrodes other than PHE-2800; NEMA-4X enclosure (6.94" × 5.25" × 3.25")

OMEGACARE™ Extended Warranty: not available for this product.

OMEGA ENGINEERING, INC.
One Omega Drive, Box 4047, Stamford, CT 06907
Telex 996404 Cable OMEGA EASYLINK: 62968934

1-800-82-66342
1-800-TC OMEGA
In CT Dial (203) 359-1660
24 Hour FAX: (203) 359-7700

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)

For use of this form, see AR 420-49; the proponent agency is USACE.

INSTALLATION: Watervliet Arsenal | PLANT: Boiler Plant | BLDG. NO.: 136 | MONTH: May '90

↓ Day	STEAM PRODUCED #1 1000 LB (1)	#2 1000 LB (2)	#3 1,000 LB. (3)	#4 1,000 LB. (4)	#5 1,000 LB. (5)	TOTAL 1,000 LB. (6)	FEED-WATER TO BOILER 1,000 LB. X (6)/666 (7)	#2+6 FUEL USED LB. M.C.F. GAL. OIL (8)	EVAP. LB. PER UNIT (9)	OUTSIDE TEMP. AV. °F. (10)	FEEDWATER HEATER PRESS. LB. (11)	FEEDWATER HEATER TEMP. °F. (12)	FEEDWATER HEATER MAKEUP GAL. X 1000 (13)	%CO2 BOILER 1 (14)	%CO2 BOILER 15 (15)	%CO2 BOILER 3 (16)	FLUE GAS TEMPERATURE BOILER 1 °F. (17)	FLUE GAS TEMPERATURE BOILER 2 °F. (18)	FLUE GAS TEMPERATURE BOILER 3 °F. (19)	FLUE TEMP 4 (20)	FLUE TEMP 5 (21)	MAKE UP % (22)	EFF. (23)	INIT.
1	324.9				282.9	607.8	544	5209	15.4	63.3	6	230	42.2		2.7		353				480	38.8	81.8	RH
2	357.9				286.3	644.2	588	5518	15.4	55.5	6	230	41.0		2.8		352				480	36.7	81.9	RH
3	317.2				289.7	606.9	515	5187	15.4	53.6	6	230	38.0		2.8		353				479	36.9	82.0	HH
4	314.3				291.6	605.9	510	5272	15.0	54.9	6	230	40.1		2.7		357				483	40.0	80.2	HH
5	276.5				297.7	574.2	488	5092	14.7	57.2	6	230	34.3		2.6		353				480	35.1	78.3	HH
6	396.8				288.6	585.4	519	5305	14.5	50.6	6	230	37.4		2.8		346				470	36.0	77.1	HH
7	31.0	551.9			274.4	857.3	604	6153	16.8	50.9	6	230	43.5		2.6		360	417			480	36.0	89.8	HH
8		703.2				703.2	596	5555	15.6	53.7	6	230	40.5					430				34.0	83.3	HH
9		630.5				630.5	541	5004	15.6	68.2	6	230	42.1					407				38.9	82.9	HH
10		610.1				610.1	512	4862	15.5	65.6	6	230	41.5					400				40.5	82.6	RH
11		300.7				300.7	240	2317	16.0	51.9	6	230	19.6					410				40.0	85.4	RH
12																								
13																								
14																								
15																								
16																								
17																								
18																								
19																								
21																								
21																								
22																								
23																								
24																								
25																								
26																								
27																								
28																								
29																								
30																								
31																								
TOTAL		2796.4			2011.2	6726.2	5627	55474	169.9	615.4	66	2530	419.8		19		2474	2064			3352	412.9	905.3	
MAXIMUM		703.2			297.7	857.3	604	6153	16.8	68.2	6	230	435		2.8		360	430			483	405	89.8	
MINIMUM		300.7			274.4	300.7	240	2317	14.5	47.2	6	230	19.2		2.6		346	400			470	34.0	77.1	
AVERAGE		559.3			287.3	611.5	511.5	5043	15.4	55.9	6	230	38.2		2.7		353	413			479	375	82.3	

EVAPORATION LB. STEAM PER LB. STD. FUEL

FUEL USED DURING MONTH (STANDARD TONS)

REMARKS * total includes 17,300 gal #2 oil and 38,174 gal #6 oil

SEE REVERSE SIDE FOR INSTRUCTIONS

PREPARED BY: R. O. Brunk | DATE: 6/11/90

APPROVED BY | DATE | POST ENGINEER | DATE

DA FORM 3067 ... PREVIOUS EDITIONS WHICH WILL BE USED

81-7

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)

For use of this form, see AR 420-49; the proponent agency is USACE.

INSTALLATION: WATERVLIET ARSENAL | PLANT: BOILER PLANT | BLDG. NO.: 35 | ONTH: JUNE 90

DATE	STEAM PRESSURE LB. (1)	STEAM PRODUCED BOILER 6 1,000 LB. (2)	BOILER 2 1,000 LB. (3)	BOILER 3 1,000 LB. (4)	TOTAL 1,000 LB. (5)	FEED-WATER TO BOILER 1,000 LB. (6)	GAS FUEL USED LB. M.C.F. GAL. (7)	EVAP. LB. PER UNIT (8)	FW OUTSIDE TEMP. AV. °F. (9)	FEEDWATER HEATER PRESS. LB. (10)	FEEDWATER HEATER TEMP. °F. (11)	MAKEUP GAL. X100 (12)	%CO2 BOILER 6 (13)	%CO2 BOILER 2 (14)	%CO2 BOILER 3 (15)	FLUE GAS TEMPERATURE BOILER 6 °F. (16)	FLUE GAS TEMPERATURE BOILER 2 °F. (17)	FLUE GAS TEMPERATURE BOILER 3 °F. (18)	TEMP. H.W. SUPPLY °F. (19)	TUBES CLEANED NUMBER OF TIMES (20)	PREVENT MAINT. CHECK (21)	EFF (22)	INIT (23)
1	135	138.4			138.4		1701	17.3	278	6	230	21.2	4.7			363						92.3	JH
2	135	103.6			103.6		1321	16.6	280	6	230	15.9	6.0			360						88.5	RH
3	135	143.9			143.9		1800	17.0	270	6	230	20.5	4.3			364						91.7	RH
4	135	223.4			223.4		2666	17.8	278	6	230	29.8	3.3			371						94.9	RH
5	135	204.7			204.7		2447	17.8	280	6	230	28.7	4.0			365						94.5	RH
6	135	193.5			193.5		2332	17.7	280	6	230	27.2	4.7			370						94.3	TM
7	135	156.1			156.1		1901	17.5	280	6	230	15.9	4.4			363						93.3	RH
8	135	40.7			40.7		663	13.1	280	6	230	9.5	6.5			360						69.6	PM
9	///	///			///		///	///	///	///	///	///	///			///						///	///
10	135	75.4			75.4		1007	15.9	280	6	230	12.5	6.8			340						84.9	PM
11	135	174.4			174.4		2181	17.5	280	6	230	21.9	5.8			367						93.3	PM
12	135	169.3			169.3		2180	17.3	280	6	230	24.3	5.6			372						92.3	PM
13	135	169.2			169.2		2070	17.4	280	6	225	24.0	4.7			370						92.7	PM
14	135	190.0			190.0		2307	17.5	280	6	225	26.2	4.8			367						93.4	PM
15	135	86.4			86.4		1089	16.8	280	6	235	12.5	5.0			368						89.9	PM
16	///	///			///		///	///	///	///	///	///	///			///						///	///
17	135	92.0			92.0		1660	11.7	280	6	230	32.2	6.5			330						65.3	HH
18	135	167.0			167.0		2080	17.0	280	6	230	24.5	6.0			347						90.6	HH
19	135	169.3			169.3		2101	17.0	280	6	230	24.1	4.8			348						90.6	HH
20	135	171.4			171.4		2110	17.2	280	6	230	24.5	5.5			356						91.7	HH
21	135	189.2			189.2		2299	17.5	280	6	230	26.5	4.8			370						93.3	PK
22	135	71.2			71.2		939	16.1	280	6	230	12.7	5.7			360						85.9	PK
23	///	///			///		///	///	///	///	///	///	///			///						///	///
24	135	139.8			139.8		1752	16.9	280	6	230	19.4	4.0			360						90.4	PK
25	135	212.7			212.7		2558	17.7	280	6	230	30.8	4.6			370						94.3	PM
26	135	202.0			202.0		2434	17.7	280	6	230	30.3	4.0			368						94.1	JH
27	135	201.4			201.4		2446	17.5	282	6	230	30.4	4.7			367						93.4	JH
28	135	192.6			192.6		2328	17.6	277	6	230	29.0	4.3			368						93.8	JH
29	135	139.1			139.1		1745	17.0	283	6	230	22.3	6.0			340						90.4	JH
30	135	88.4			88.4		1251	15.0	285	6	230	15.3	7.4			355						81.2	RH
31																							
TOTAL	4050	4110.0			4110.0		51373	453.1	7553	162	6195	711.6	137.7			9695						2416.0	
MAXIMUM	135	223.4			223.4		2666	17.8	285	6	230	32.2	6.8			371						94.9	
MINIMUM	135	40.7			40.7		663	11.7	270	6	225	9.5	3.3			330						62.3	
AVERAGE	135	152.2			152.2		1902.7	16.8	279.7	6	229	27.6	5.1			359						89.5	

EVAPORATION LB. STEAM PER LB. STD. FUEL

FUEL USED DURING MONTH (STANDARD TONS)

REMARKS

SEE REVERSE SIDE FOR INSTRUCTIONS

PREPARED BY: R.O. Drank | DATE: 7/9/90

APPROVED BY | DATE | POST ENGINEER | DATE

DA FORM 2067

61-9

FACILITIES ENGINEERING OPERATING LOG *(Boiler Plant)*

For use of this form, see AR 420-49; the proponent agency is USACE.

INSTALLATION: WATERVLIET ARSENAL | PLANT: BOILER PLANT | BLDG. NO.: 35 | MONTH: July 90

DATE	STEAM PRODUCED: STEAM PRESSURE (LB.)	BOILER 6 (1,000 LB.)	BOILER 2 (1,000 LB.)	BOILER 3 (1,000 LB.)	TOTAL (1,000 LB.)	FEED-WATER TO BOILER (1,000 LB.)	GAS FUEL USED LB. M.C.F. GAL.	EVAP. LB. PER UNIT	OUTSIDE TEMP. FEED PUMP	FEEDWATER HEATER: PRESS. LB.	TEMP. °F.	MAKEUP GAL. X100	%O_2 BOILER 6	%O_2 BOILER 2	%O_2 BOILER 3	FLUE GAS TEMPERATURE BOILER 6 °F.	FLUE GAS TEMPERATURE BOILER 2 °F.	FLUE GAS TEMPERATURE BOILER 3 °F.	TEMP. H.W. SUPPLY °F.	TUBES CLEANED NUMBER OF TIMES	PREVENT MAINT. CHECK	EFF	INIT
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
1	135	115.9			115.9		1591	15.5	285	8	230	18.7	7.7			350						82.6	RH
2	135	153.3			153.3		1881	17.3	283	8	230	22.7	6.3			360						92.2	RH
3	135	102.0			102.0		1346	16.1	280	8	230	15.5	6.2			357						86.0	RH
4	135	126.9			126.9		1716	15.7	280	8	230	15.3	6.2			355						83.7	PK
5	135	178.3			178.3		2185	17.4	280	8	230	26.8	5.6			368						92.8	RH
6	135	88.7			88.7		1082	17.4	280	8	230	12.3	5.9			365						93.0	PK
7																							
8	135	130.0			130.0		1557	17.7	280	8	230	15.9	3.7			370						92.7	PK
9	135	135.1			135.1		1705	16.8	280	8	230	19.0	6.1			365						89.5	PK
10	135	129.7			129.7		1645	16.7	280	8	230	18.6	6.8			365						89.4	PK
11	135	166.0			166.0		2051	17.2	280	8	230	27.0	6.0			360						91.8	PK
12	135	172.3			172.3		2115	17.3	280	8	230	26.6	6.2			365						92.4	PK
13	135	146.8			146.8		1789	17.5	285	8	230	23.4	6.5			365						93.1	PK
14	135	152.6			152.6		1903	17.1	280	8	230	23.1	6.0			365						91.1	HH
15	135	140.7			140.7		1781	16.8	280	8	230	16.8	6.0			365						89.5	HH
16	135	165.1			165.1		2055	17.0	300	8	230	21.8	6.0			365						90.6	HH
17	135	165.3			165.3		2053	17.0	300	8	230	25.7	5.5			365						90.6	PK
18	135	156.9			156.9		1965	17.0	293	8	230	25.5	5.6			373						90.6	JH
19	135	123.4			123.4		1597	16.4	290	8	230	21.7	5.8			358						87.7	JH
20	135	22.9			22A		477	17.4	290	8	230	8.2	7.2			365						92.7	HH
21	—	CHANGE																					
22																							
23																							
24																							
25																							
26																							
27																							
28																							
29																							
30																							
31																							
TOTAL		2571.9			2571.9		37[illegible]	521.3	5406			384.7	115.3			8991						17[illegible]	
MAXIMUM		178.3			178.3		2185	17.7	300	8	230	27.0	7.7			373						93.1	
MINIMUM		22.9			22.9		1346	15.5	280	8	230	8.3	3.7			350						83.6	
AVERAGE		128.6			128.6		[illegible]	17.0	[illegible].9	8	230	20.2	6.1			363						91.1	

EVAPORATION LB. STEAM PER LB. STD. FUEL

FUEL USED DURING MONTH (STANDARD TONS)

REMARKS

SEE REVERSE SIDE FOR INSTRUCTIONS

PREPARED BY: R.D. Grant — DATE: 8/6/90

APPROVED BY — DATE — POST ENGINEER — DATE

DA FORM 1 NOV 72 3967 REPLACES DA FORM 5-98, 1 JUN 58, WHICH WILL BE USED.

6-20

FACILITIES ENGINEERING OPERATING LOG *(Boiler Plant)*

For use of this form, see AR 420-49; the proponent agency is USACE.

INSTALLATION: Watervliet Arsenal | PLANT: Boiler Plant | BLDG. NO.: 25 | MONTH: Aug 90

DATE	STEAM PRODUCED: STEAM PRESSURE (LB.) (1)	BOILER #6 (1,000 LB.) (2)	BOILER 2 (1,000 LB.) (3)	BOILER 3 (1,000 LB.) (4)	TOTAL (1,000 LB.) (5)	FEED-WATER TO BOILER (1,000 LB.) (6)	GAS FUEL USED LB. M.C.F. GAL. (7)	EVAP. LB. PER UNIT (8)	OUTSIDE TEMP. AT FEED PUMP (9)	FEEDWATER HEATER: PRESS. LB. (10)	FEEDWATER HEATER: TEMP. °F. (11)	MAKEUP GAL. (12)	%CO2 BOILER 6 (13)	%CO2 BOILER 2 (14)	%CO2 BOILER 3 (15)	FLUE GAS TEMPERATURE BOILER 6 °F. (16)	FLUE GAS TEMPERATURE BOILER 2 °F. (17)	FLUE GAS TEMPERATURE BOILER 3 °F. (18)	TEMP. H.W. SUPPLY °F. (19)	TUBES CLEANED NUMBER OF TIMES (20)	PREVENT MAINT. CHECK (21)	EFF (22)	INIT (23)
1																							
2					SUN - MOON																		
3																							
4	135	133.5			133.5		1910	16.8	290	8	230	21.2	5.0			360						89.9	DK
5	135	114.2			114.2		1170	16.8	290	8	230	16.2	7.0			360						89.9	DK
6	135	139.8			139.8		1955	17.0	270	8	230	24.4	5.6			360						90.6	DK
7	135	139.5			139.5		1760	16.5	280	8	230	22.2	6.0			356						89.9	DK
8	135	157.1			157.1		1940	17.2	275	8	230	24.2	4.6			362						91.5	DK
9	135	167.1			167.1		2066	17.2	280	8	230	27.2	6.0			367						91.7	DK
10	135	53.6			53.6		765	14.5	280	8	230	11.2	7.5			361						77.3	DK
11	SHUT DOWN																						
12	135	109.1			109.1		1396	17.8	300	8	230	15.0	6.0			360						94.9	DK
13	135	160.5			160.5		2003	16.9	295	8	230	25.2	5.5			363						90.1	DK
14	135	116.5			116.5		1540	15.8	300	8	230	31.6	5.8			360						84.2	DK
15	135	164.1			164.1		2020	17.0	295	8	230	25.8	5.1			362						90.6	DK
16	135	161.7			161.7		2000	17.2	290	8	230	25.6	5.0			366						91.7	DK
17	135	71.4			71.4		960	16.7	267	8	230	13.0	5.5			347						89.1	DK
18	SHUT DOWN																						
19	135	106.9			106.9		1329	17.1	300	8	230	16.3	4.6			360						91.1	DK
20	135	176.3			176.3		2152	17.4	290	8	230	27.9	4.6			386						92.7	DK
21	135	205.5			205.5		2483	17.6	290	8	230	31.5	5.0			366						93.8	DK
22	135	187.6			187.6		2280	17.5	290	8	230	29.1	4.9			365						93.3	DK
23	135	160.2			160.2		1999	17.0	290	8	230	26.5	5.1			365						90.6	DK
24	135	98.0			98.0		1203	17.1	290	8	230	16.5	4.2			362						87.1	DK
25	SHUT DOWN																						
26	135	190.5			190.5		2390	17.1	290	8	230	31.8	4.3			361						92.1	DK
27	135	174.3			174.3		2167	17.1	—	8	230	27.2	5.5			362°						91.1	DK
28	135	183.6			183.6		2292	17.0	230	8	230	29.1	4.7			357°						90.6	DK
29	135	191.3			191.3		2353	17.2	255	8	230	29.2	4.3			365°						91.7	DK
30	135	171.9			171.9		2239	16.3	250	8	230	28.6	4.5			362°						86.9	DK
31	135	138.4			139.4		1720	17.1	250	8	235	22.6	5.0			362°						91.1	DK
TOTAL		3570.6			5670.6		46329	421.7	6933			599	131.3			9147						2548.9	
MAXIMUM		205.5			205.5		2590	17.8	367	8	230	37.2	7.0			367						94.9	
MINIMUM		53.6			53.6		765	14.5	230	8	230	11.2	4.2			356						77.3	
AVERAGE		147.1			147.1		1953	16.9	277	8	230	24.0	5.3			362						91.9	

EVAPORATION LB. STEAM PER LB. STD. FUEL

FUEL USED DURING MONTH (STANDARD TONS)

REMARKS

SEE REVERSE SIDE FOR INSTRUCTIONS

PREPARED BY: R. D. Brank | DATE: 9/5/90

APPROVED BY | DATE | POST ENGINEER | DATE

DA FORM 1 NOV 72 3967 REPLACES DA FORM 5-98 1 JUN 58, WHICH WILL BE USED.

12-9

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)

For use of this form, see AR 420-49; the proponent agency is USACE.

INSTALLATION: WATERVLIET ARSENAL | PLANT: BOILER PLANT | BLDG. NO.: 35 | MONTH: SEPT. 90

DATE	STEAM PRODUCED: STEAM PRESSURE LB. (1)	BOILER 6 1,000 LB. (2)	BOILER 2 1,000 LB. (3)	BOILER 3 1,000 LB. (4)	TOTAL 1,000 LB. (5)	FEED-WATER TO BOILER 1,000 LB. (6)	GAS FUEL USED LB. M.C.F. GAL. (7)	EVAP. LB. PER UNIT (8)	FEEDWATER HEATER: FEED OUTSIDE TEMP °F. (9)	PRESS. LB. (10)	TEMP. °F. (11)	MAKEUP GAL. (12)	%CO2 BOILER 6 (13)	%CO2 BOILER 2 (14)	%CO2 BOILER 3 (15)	FLUE GAS TEMPERATURE BOILER 6 °F. (16)	BOILER 2 °F. (17)	BOILER 3 °F. (18)	TEMP. H.W. SUPPLY °F. (19)	TUBES CLEANED NUMBER OF TIMES (20)	PREVENT MAINT. CHECK (21)	EFF (22)	INIT (23)
									260	8	230	25.3	3.4			375						68.6	PK
1	135	29.7			29.7		491																
2									250	8	230	25.3	4.1			375						93.3	PK
3	135	113.2			113.2		1376		250	8	230	24.9	4.3			362°						89.3	
4	135	142.0			142.0		1793		250	8	230	19.7	5.2			357°						87.3	
5	135	110.6			110.6		1436		250	8	230	23.9	5			362						91.7	
6	135	166.9			166.9		2063		250	8	230	19.1	6			360°						93.7	
7	135	108.3			108.3		1466		250	8	230	11.1	8			325						92.9	H.H.
8	135	42.6			42.6		752		250	8	230	15.9	6.5			360						94.3	H.H.
9	135	49.3			49.3		1041		250	8	230	27.7	5.0			362						93.3	H.H.
10	135	184.3			184.3		2206		250	8	230	17.1	4.5			361						91.6	H.H.
11	135	172.3			172.3		2155		250	8	230	22.7	4.5			363						93.3	H.H.
12	135	178.2			178.2		2179		250	8	230	26.5	4.5			361							
13	135	168.7			168.7		2035		250	8	230	16.3	4.5			360						94.2	JH
14	135	81.4			81.4		1000																
15									270	8	230	16.5	5.3			360						91.6	JH
16	135	118.2			118.2		1424		250	8	230	35.0	5.2			362						92.2	JH
17	135	151.5			151.5		1875		253	8	230	24.9	4.5			363						91.5	JH
18	135	153.4			153.4		1888		253	8	230	25.0	4.6			367						91.8	JH
19	135	154.5			154.5		1915		250	8	230	25.3	4.2			368						92.3	JH
20	135	157.2			157.2		1943		250	8	230	28.0	4.5			363						97.7	PK
21	135	177.5			177.5		2181		250	8	230	15.3	4.5			362°						90.3	PK
22	135	143.2			143.2		1800		250	8	230	16.9	4.5			360						89.6	PK
23	135	148.3			148.3		1861		250	8	230	16.3	4.5			362						90.4	PK
24	135	138.8			138.8		1755		250	8	230	16.9	4.5			362						91.5	PK
25	135	154.9			154.9		1940		250	8	230	17.1	3.9			365						93.6	PK
26	135	166.3			166.3		2060		250	8	230	17.3	3.5			365						92.2	RH
27	135	179.8			179.8		2201		250	8	230	28.1	3.5			363						92.6	RH
28	135	176.9			176.9		2172		253	8	230	31.6	4.5			368						92.7	PK
29	135	177.8			177.8		2178		250	8	230	24.4	6			360°							
30	135	179.7			179.7		2185															2497.2	
31									7034			617.3	130.4			10137						93.3	
TOTAL		3983.5			3983.5		49696		270			31.6	8			368						68.6	
MAXIMUM		180.3			180.3		2206		250			11.1	3.4			325						89.2	
MINIMUM		29.7			29.7		491		251			22.0	4.6			362							
AVERAGE		142.2			142.2		1775																

EVAPORATION LB. STEAM PER LB. STD. FUEL

SEE REVERSE SIDE FOR INSTRUCTIONS

FUEL USED DURING MONTH (STANDARD TONS)

PREPARED BY: R. Drank | DATE: 10/5/90

REMARKS

APPROVED BY | DATE | POST ENGINEER | DATE

DA FORM 2067 ... WHICH WILL BE USED.

6-22

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)

For use of this form, see AR 420-49; the proponent agency is USACE.

INSTALLATION: WATERVLIET ARSENAL | PLANT: BOILER PLANT | BLDG. NO.: T35 | MONTH: OCT. 90

DATE	STEAM PRODUCED: STEAM PRESSURE	BOILER X6	BOILER 2	BOILER 3	TOTAL	FEED-WATER TO BOILER	G45 FUEL USED LB. M.C.F. GAL.	EVAP. LB. PER UNIT	OUTSIDE TEMP. AV. FEED PUMP F	FEEDWATER HEATER: PRESS.	FEEDWATER HEATER: TEMP.	FEEDWATER HEATER: MAKEUP GAL.	%CO2 BOILER 6	%CO2 BOILER 2	%CO2 BOILER 3	FLUE GAS TEMPERATURE BOILER 6	FLUE GAS TEMPERATURE BOILER 2	FLUE GAS TEMPERATURE BOILER 3	TEMP. H.W. SUPPLY	TUBES CLEANED NUMBER OF TIMES	PREVENT MAINT. CHECK	EFF.	INIT.
	LB.	1,000 LB.	1,000 LB.	1,000 LB.	1,000 LB.	1,000 LB.				LB.	°F.	X1000				°F.	°F.	°F.	°F.				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
																						91.1	PK
																						93.3	PC
1	135	173.2			173.2		2156	17.0	250	8	230°	26.6	4.0			368						92.3	PC
2	136	256.6			256.6		3083	17.7	250	8	230°	37.1	4.0			370°							
3	135	183.5			183.5		2254	17.3	250	8	230°	28.8	4.2			368							
4		115.5																					
5	125																						
6																							
7																						98.6	LH
8								18.5	250	8	230		4.1			375						97.5	LH
9												39.5											
10																							
11																							
12																							
13																							
14																							
15																							
16																							
17																							
18																							
19																							
20																							
21																							
22																							
23																							
24																							
25																							
26																							
27																							
28																							
29																							
30																						1429	
31																						98.6	
TOTAL					31550		37780	265	250	120	345	470.4										88.5	
MAXIMUM		324.4			324.4		3724	18.5	250	8	230	45.2	5.1			376						93.3	
MINIMUM		32.7			32.7		377	16.6	250	8	230	6.0	3.0			358							
AVERAGE		210.3			210.3		2519	17.7	250	8	230	31.4	4.2			368							

EVAPORATION LB. STEAM PER LB. STD. FUEL

FUEL USED DURING MONTH (STANDARD TONS)

REMARKS

SEE REVERSE SIDE FOR INSTRUCTIONS

PREPARED BY: R. D. Brault | DATE: 11/16/90

APPROVED BY | DATE | POST ENGINEER | DATE

DA FORM 1 NOV 72 3967 REPLACES DA FORM 5-98, 1 JUN 58, WHICH WILL BE USED.

6-23

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.

REQUIREMENT CONTROL SYMBOL
DD-M(R) 1561

2. TO:
CDR, AMC (AMCRM-MP)
5001 Eisenhower Avenue
Alexandria, VA 22333-0001

3. THRU:

4. FROM:
CDR, AMCCOM
Attn: AMSMC-MGP-P (R)
Rock Island, IL 61299-6000

5. DOD COMP NAME: Army

6. DOD COMP CODE: A

7. COMMAND CODE: W73QKK

8. DATE:

9. PROJECT TITLE
Natural Gas Boilers (ECO #12)

10. TYPE OF PROJECT *(Check one)*
[X] QRIP [ ] OSD PIF [ ] PECIP

11. AMORTIZATION YEARS/MONTHS
$ 49,900 (Project Cost) ÷ 37,800 (Average Annual Savings) x 12 (No. Mos)
= 1.3 (years) or _____ (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR
024

13. ECONOMIC LIFE
25 years

14. EXPECTED OPERATIONAL DATE

15. SUBMITTING UNIT(S)
Commander
Watervliet Arsenal
Attn: SMCWV-FE
(W. Face)
Building 120
Watervliet, NY 12189

16. UNIT ID CODE
WOK9AA

17. PROJECT DESCRIPTION
Install natural gas boilers to replace electric boilers used to provide humidification in Buildings 40, 44 and 125.

18. DETAILED JUSTIFICATION
Using natural gas to provide steam for humidification is less expensive than electricity.

19. SAVINGS DISPOSITION
Savings are used to reduce energy expenditures.

20. OTHER REMARKS *(Continue on page 5, if more space is needed)*

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. **SUMMARY OF DOLLAR SAVINGS**
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* Elec & Nat Gas	$50,800	$13,000	$13,000	$13,000	$13,000	$37,800	$37,800	$37,800	$37,800
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	**$50,800**	**$13,000**	**$13,000**	**$13,000**	**$13,000**	**$37,800**	**$37,800**	**$37,800**	**$37,800**

b. **PRIORITIZATION**

(1) **INTERNAL RATE OF RETURN** *(IRR)*

Divide estimated project cost $49,900 by average annual savings $37,800 = 1.3 factor. Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 125 % IRR.

(2) **SAVINGS TO INVESTMENT RATIO (S/I)**

Multiply annual savings $37,800 X discount factor 9.524 = 360,007 and divide by present value of investment *(undiscounted)* 49,900 = 7.2 *S/I.*

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) **RATE OF INVESTMENT PER MANPOWER SPACE** *(RIMS)*

Divide estimated project cost -- by number of manpower space savings -- = -- RIMS. *(Manpower requirements cannot be used in this computation.)*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)–Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE *a*	PROPOSED SOURCE OF PROCUREMENT *b*	UNIT PRICE *c*	QUANTITY *d*	TOTAL COST *e*	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT *f*	FY FUNDS REQUIRED *g*
(1) Natural Gas Boilers		$49,900	1	$49,900		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION *(Equipment delivery)*						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER *(Specify):*						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$49,900		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$49,900		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]						
(16) **TOTAL** *(Sum of (14) + (15) above)*				$49,900		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*
[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*
[3] *Normally not OPA funded.*
[4] *Used to compute amortization in Item 11.*
[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
a	*b*	*c*	*d*	*e.* FROM	*f.* TO	*g.* FROM	*h.* TO	*i.* FROM	*j.* TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower), e.g.,* CONTRACT COSTS & UTILITIES			$37,800						
(8)									
(9)									
(10)									
(11) **TOTAL DOLLAR SAVINGS**			**$37,890**						

6
(1) US Graded
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7]*Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--Continued.

24. REGULATORY APPROVAL/COORDINATION

a. INVESTMENT STATEMENT

This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints.

_____

(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)

b. **OTHER COORDINATION** *(Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)*

_____

_____

25. **SUBMITTED BY** *(Typed name, grade and title of Subordinate Command/Agency or Project Initiator)*	**SIGNATURE**	**DATE** *(YYMMDD)* **AUTOVON**
26. **APPROVAL RECOMMENDED BY** *(MACOM/Agency)*	**SIGNATURE**	**DATE** *(YYMMDD)* **AUTOVON**

FOR USE BY HQDA ON OSD PIF PROJECTS ONLY

27. **APPROVED BY**	**SIGNATURE**	**DATE** *(YYMMDD)* **AUTOVON**

20. **OTHER REMARKS** *(Cont'd)*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)–(Continued).

RS&H

SUBJECT WVA - Bldgs. 40, 44 & 125 Replace Electric Boilers
DESIGNER W.T. Todd
CHECKER

AEP NO 290-0379-002
SHEET 1 OF 6
DATE 1-31-92
DATE

ECO #12

Replace Electric Boilers with Natural Gas Boilers

The electric boilers located in Buildings 40, 44, 125N and 125S are used for humidification purposes. The boiler sizes are 90 KW, 210 KW, 58 KW and 58 KW, respectively.

By replacing these boilers with boilers that utilize natural gas the cost for energy to humidify this building will be reduced by over #15 per MBtu.

The annual hours that humidification is required was calculated by a spreadsheet computer program. the results are shown on page 3. Assuming an operating diversity of 0.30, the boilers will operate:

$$5862 \text{ hrs/yr} \times 0.30 = 1759 \text{ hrs/year}$$

Current energy use (Electricity):

$$416 \text{ KW} \times 1759 \frac{\text{Hrs}}{\text{yr}} = 731,744 \text{ KWH/year}$$

$$731,744 \text{ KWH/yr} \times 3413 \frac{\text{Btuh}}{\text{KWH}} \times \frac{1 \text{ MBtu}}{10^6 \text{ Btu}} = 2497.4 \text{ MBtu/yr}$$

Future energy use (Natural Gas):

$$2497.4 \text{ MBtu/yr} \div 0.80 \text{ (eff.)} = 3121.8 \text{ MBtu/yr}$$

RS&H®

SUBJECT WVA - Bldgs. 40, 44 & 125 Replace Electric Boilers
DESIGNER W. T. Todd
CHECKER

AEP NO 290-0379-002
SHEET 2 OF
DATE 1-31-92
DATE

The Future energy use calculation assumes the same output will be required and the efficiency of the N.G. boiler is 80%.

Energy Savings = Current energy use - Future energy use

Electricity Savings = $2497.4 \frac{mBtu}{Yr} - 0 = \underline{2497.4 \frac{mBtu}{Yr}}$

Natural Gas Savings = $0 - 3121.8 \frac{mBtu}{Yr} = \underline{(3121.8) \frac{mBtu}{Yr}}$

Total Savings:

Energy: $2497.4 \frac{mBtu}{Yr} - 3121.8 \frac{mBtu}{Yr} = \underline{(624.4) \frac{mBtu}{Yr}}$

Project Implementation Cost:

Total Project Cost = $\underline{\$49,944}$

See Cost Estimate Sheets for details

RS&H®

SUBJECT ECO #12 AEP NO

SHEET OF

DESIGNER DATE

CHECKER DATE

QRIP Calculations

Present Method

ELEC = 2497.4 MBTU/yr * $20.35/MBTU = $50,800

Proposed Method

N. Gas = 3121.8 MBTU/yr * $4.16/MBTU = $13,000

Savings = $37,800

PROJECT: WATERVLIET ARSENAL LIMITED ENERGY STUDY 01/31/92

INPUTS:
1) Days Per Week That HVAC Operates — 7 Days/Week
2) Summer Room Dry Bulb Temperature — 75 'F (db)
   Room Wet Bulb Temperature — 63 'F (wb)
3) Winter Room Dry Bulb Temperature — 68 'F (db)
   If RH Controlled, wb Temp. — 57 'F (wb)
   and Ground Water Temperature — 50 'F
4) Outside Air Quantity (cfm) — 1 cfm
5) HVAC Oper. Hrs/Shft: 12 M -> 8 AM — 8 Hrs/Shift
   8 AM -> 4 PM — 8 Hrs/Shift
   4 PM -> 12 M — 8 Hrs/Shift

Temperatures			Hours of Occurrence			Total Oper.	Outside Air Load (MBtu/Yr)			
db-Range		wb	00-08	08-16	16-24	Hours	Cooling	Dehumid	Heating	Humid.
120	124					0	0.0000	0.0000	0.0000	0.0000
115	119					0	0.0000	0.0000	0.0000	0.0000
110	114					0	0.0000	0.0000	0.0000	0.0000
105	109					0	0.0000	0.0000	0.0000	0.0000
100	104					0	0.0000	0.0000	0.0000	0.0000
95	99	75	0	7	0	7	0.0002	0.0001	0.0000	0.0000
90	94	72	0	28	6	34	0.0006	0.0004	0.0000	0.0000
85	89	71	0	95	28	123	0.0016	0.0018	0.0000	0.0000
80	84	68	4	177	73	254	0.0020	0.0024	0.0000	0.0000
75	79	66	27	248	140	415	0.0009	0.0032	0.0000	0.0000
70	74	64	115	257	222	594	0.0000	0.0039	0.0000	0.0000
65	69	61	234	235	271	740	0.0000	0.0019	0.0000	0.0000
60	64	57	263	212	252	727	0.0000	0.0000	0.0048	0.0000
55	59	52	274	190	236	700	0.0000	0.0000	0.0085	0.0009
50	54	48	263	183	214	660	0.0000	0.0000	0.0116	0.0036
45	49	43	242	183	205	630	0.0000	0.0000	0.0146	0.0069
40	44	38	229	202	205	636	0.0000	0.0000	0.0182	0.0099
35	39	34	261	241	251	753	0.0000	0.0000	0.0257	0.0133
30	34	30	295	220	262	777	0.0000	0.0000	0.0308	0.0152
25	29	25	216	156	191	563	0.0000	0.0000	0.0254	0.0128
20	24	20	163	112	130	405	0.0000	0.0000	0.0205	0.0103
15	19	16	110	79	96	285	0.0000	0.0000	0.0160	0.0074
10	14	11	84	43	65	192	0.0000	0.0000	0.0118	0.0053
5	9	6	60	27	38	125	0.0000	0.0000	0.0084	0.0036
0	4	2	37	16	22	75	0.0000	0.0000	0.0054	0.0022
-5	-1	-3	27	3	9	39	0.0000	0.0000	0.0030	0.0012
-10	-6	-8	10	0	4	14	0.0000	0.0000	0.0012	0.0004
-15	-11	-13	5	0	0	5	0.0000	0.0000	0.0004	0.0002
-20	-16	-17	3	0	0	3	0.0000	0.0000	0.0003	0.0001
-25	-21					0	0.0000	0.0000	0.0000	0.0000
-30	-26					0	0.0000	0.0000	0.0000	0.0000
-35	-31					0	0.0000	0.0000	0.0000	0.0000
-40	-36					0	0.0000	0.0000	0.0000	0.0000
-45	-41					0	0.0000	0.0000	0.0000	0.0000
Totals			2922	2914	2920	8756	0.0053	0.0138	0.2066	0.0935
Total operating hours for each system							833	2167	6589	5862

CONSTRUCTION COST ESTIMATE	DATE PREPARED 1-31-92	SHEET 4 OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: WATERVLIET ARSENAL

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS

BASIS FOR ESTIMATE: [X] CODE A (No design completed) [ ] CODE B (Preliminary design) [ ] CODE C (Final design) [ ] OTHER (Specify)

DRAWING NO.

ESTIMATOR: W. T. Todd

CHECKED BY

Hyp #	Replace Ele. Boiler SUMMARY Bldgs. 40 & 125	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
151 M	320 MBH Gas-fired Boiler	1	EA	1125	1125	2640	2640	3765
151 M	203 MBH Gas-Fired Boiler	2	EA	865	1730	1840	3680	5410
158 M	Automatic Flue Damper	3	EA	17	51	118	354	405
184 M (1)	6"ø Gal. Steel Flue Chimney	90	VLF	7.20	648	5.00	450	1098
38 M (2)	Sch. 40 Black Steel Pipe	300	LF	7.20	2160	3.98	1194	3354
162 E	Electric Switching	3	EA	91	273	485	1455	1728
185 M	6"ø Roof Flashing	3	EA	12	36	9	27	63
(3)	Remove Exist. Boiler	3	EA	400	1200	-0-	-0-	1200
201 M	Pressure Regulator	3	EA	18.55	56	389	1167	1223
	Subtotal				$7,279		$10,967	$18,246

Source : Means Mechanical Cost Data, 1991
Means Electrical Cost Data, 1991

(1) 20% added for fittings, includes rain cap.

(2) Includes Hangars, 20% added for Fittings

(3) 2 men at $25 per hour for 2 days

CONSTRUCTION COST ESTIMATE	DATE PREPARED 2-5-92	SHEET 5 OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: WATERVLIET ARSENAL

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS

BASIS FOR ESTIMATE: [X] CODE A (No design completed) [ ] CODE B (Preliminary design) [ ] CODE C (Final design) [ ] OTHER (Specify)

DRAWING NO.

ESTIMATOR: W. T. Todd

CHECKED BY

	Replace Elec. Boiler SUMMARY Building 44	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
M151	765 MBH Gas-fired Boiler	1	EA	1725	1725	5740	5740	7465
M158	Automatic Flue Damper	1	EA	18	18	128	128	146
M184 (1)	8"Ø Gal. Steel Flue chimney	30	VLF	8.28	249	8.21	247	496
M88 (2)	Sch. 40 Blk. Steel Pipe	50	LF	7.20	360	3.98	199	559
M201	Pressure Regulator	1	EA	18.55	19	389	389	408
M185	8"Ø Roof Flashing	1	EA	13.85	14	12.40	13	27
E162	Electric Switching	1	EA	91	91	485	485	576
(3)	Remove Exist. Boiler	1	EA	400	400	-0-	-0-	400
M18	Excavate & Backfill Trench, 8"	150	LF	0.21	32	0.17	26	58
M22 (2)	Sch. 40 Steel, Coated Pipe	155	LF	3.34	518	4.21	653	1171
M[illegible]	Crushed Stone Bedding, 6"	2	CY	3.01	6	14.17	29	35
	Subtotal				$3432		$7909	$11,341

Source: Means Mechanical Cost Data, 1991
Means Electrical Cost Data, 1991

(1) 20% added for Fittings, includes rain cap

(2) Includes Hangars, 20% added for fittings

(3) 2 men at $25 per hour for 2 days

ENG FORM 150 1 AUG 59 (ER 1110-345-730) PREVIOUS EDITION MAY BE USED (TRANSLUCENT)

* U.S. GOVERNMENT PRINTING OFFICE : 1959 O—516146

02/05/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace Electric Boilers with Natural Gas Boilers

ECO #:

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$18,876
Labor	$10,711
Subtotal bare costs	$29,587
FICA Insurance (20% of Labor)	$2,142
Sales Tax (Not Applicable For GOGO)	$0
Subtotal	$31,729
Overhead (15%)	$4,759
Subtotal	$36,488
Profit (10%)	$3,649
Subtotal	$40,137
Bond (1%)	$401
Subtotal	$40,538
Contingency (10%)	$4,054
Subtotal (Construction Cost Input For LCCID *)	$44,592
SIOH (6.0% of Construction Cost)	$2,676
Subtotal	$47,268
Design (6.0% of Construction Cost)	$2,676
Total Project Cost	$49,944

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

OSD PIF

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.	REQUIREMENT CONTROL SYMBOL DD-M(R) 1561	
	5. DOD COMP NAME: Army	6. DOD COMP CODE: A
	7. COMMAND CODE: W73QKK	8. DATE:

2. TO:	3. THRU:	4. FROM:
HQ. DA (EACA-RMP) Rm 3B719 (Pentagon) Washington, DC 20310-2070	CDR, AMC (AMCRM-MP) 5001 Eisenhower Avenue Alexandria, VA 22333-0001	CDR, AMCCOM Attn: AMSMC-MGP-P (R) Rock Island, IL 61299-6000

9. PROJECT TITLE
Dip Tank Covers and Variable Speed Drives (ECO #4)

10. TYPE OF PROJECT *(Check one)*
☐ QRIP ☒ OSD PIF ☐ PECIP

11. AMORTIZATION YEARS/MONTHS
$ 214,043 (Project Cost) ÷ $141,900 (Average Annual Savings) x 12 (No. Mos)
= 1.5 (years) or _____ (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR
024

13. ECONOMIC LIFE
25 years

14. EXPECTED OPERATIONAL DATE

15. SUBMITTING UNIT(S)	16. UNIT ID CODE
Commander Watervliet Arsenal Attn: SMCWV-FE (W. Face) Building 120 Watervliet, NY 12189	WOK9AA

17. PROJECT DESCRIPTION
Install flexible, chemically resistant cover on dip tanks in the Small Parts Plating Area in Building 35. Also install variable speed drives on exhaust fan motor and associated controls to provide a constant pressure differential across the fan.

18. DETAILED JUSTIFICATION
By installing the tank covers and VSDs/controls, energy can be saved. When the covers are in place, the VSD/controls will reduce the motor speed to maintain the same pressure differential across the fan without the cover.

19. SAVINGS DISPOSITION
Savings are used to reduce energy expenditures.

20. OTHER REMARKS *(Continue on page 5, if more space is needed)*

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. **SUMMARY OF DOLLAR SAVINGS**
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* #6 F.O. & Elc.	$505,000	$354,700	$354,700	$354,700	$354,700	$141,900	$141,900	$141,900	$141,900
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	**$505,000**	**$354,700**	**$354,700**	**$354,700**	**$354,700**	**$141,900**	**$141,900**	**$141,900**	**$141,900**

b. **PRIORITIZATION**

(1) **INTERNAL RATE OF RETURN** *(IRR)*

Divide estimated project cost 214,043 by average annual savings $141,900 = 1.5 factor. Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 95 % IRR.

(2) **SAVINGS TO INVESTMENT RATIO (S/I)**

Multiply annual savings $141,900 X discount factor 9.524 = 1,351,456 and divide by present value of investment *(undiscounted)* 214,043 = 6.3 *S/I.*

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) **RATE OF INVESTMENT PER MANPOWER SPACE** *(RIMS)*

Divide estimated project cost -- by number of manpower space savings -- = -- RIMS. *(Manpower requirements cannot be used in this computation.)*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE *a*	PROPOSED SOURCE OF PROCUREMENT *b*	UNIT PRICE *c*	QUANTITY *d*	TOTAL COST *e*	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT *f*	FY FUNDS REQUIRED *g*
(1) Tank Covers and Variable-Speed Drives				$214,043		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION *(Equipment delivery)*						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER *(Specify):*						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$214,043		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$214,043		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]						
(16) **TOTAL** *(Sum of (14) + (15) above)*				$214,043		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*
[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*
[3] *Normally not OPA funded.*
[4] *Used to compute amortization in Item 11.*
[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
a	*b*	*c*	*d*	*e.* FROM	*f.* TO	*g.* FROM	*h.* TO	*i.* FROM	*j.* TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower), e.g.,* CONTRACT COSTS & UTILITIES			$141,900						
(8)									
(9)									
(10)									
(11) **TOTAL DOLLAR SAVINGS**			**$141,900**						

6
(1) US Graded
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7]*Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Page 4 of DA Form 5108-R

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--Continued.

24. REGULATORY APPROVAL/COORDINATION

a. INVESTMENT STATEMENT

This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints.

_____

(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)

b. **OTHER COORDINATION** *(Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)*

_____

_____

25. **SUBMITTED BY** *(Typed name, grade and title of Subordinate Command/Agency or Project Initiator)*	**SIGNATURE**	**DATE** *(YYMMDD)* **AUTOVON**
26. **APPROVAL RECOMMENDED BY** *(MACOM/Agency)*	**SIGNATURE**	**DATE** *(YYMMDD)* **AUTOVON**
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		
27. **APPROVED BY**	**SIGNATURE**	**DATE** *(YYMMDD)* **AUTOVON**

20. **OTHER REMARKS** *(Cont'd)*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)–(Continued).

RS&H®

SUBJECT ECO#4 WVA DIP TANK
DESIGNER P. Hutchins
CHECKER B. Todd

AEP NO 290-0379-002
SHEET ____ OF ____
DATE 7/22/91
DATE 9/16/91

ECO#4 Dip Tank Covers with Exhaust Fan Controllers

Assumptions:

- Room Temperature = 68°F
- Heat Load Factor (HLF) (Vol II, App B. pp I-8 thru I-10)
  - HLF_1 = 0.145 MBtu/yr/cfm (24h/d, 5d/w)
  - HLF_2 = 0.092 MBtu/yr/cfm (16h/d, 5d/w)
  - HLF_3 = 0.044 MBtu/yr/cfm (8h/d, 5d/w)
  - HLF_4 = 0.204 MBtu/yr/cfm (24h/d, 7d/w)
- Fan and motor efficiency = 0.5
- Steam Generation Efficiency Avg. = 0.80 (ECO#6)
- Fan ΔP = 3 in. w.c.
- Leakage with cover in place - 10% of uncovered
- Calculate present energy use - fuel oil for heating OSA replacing exhausted air and electricity used by fan motors

Fuel Oil

$$E_{OSA} = \frac{CFM * 0.204\ MBTU/yr/cfm}{\text{STEAM Gen. eff}}$$

$$hp = \frac{cfm \cdot \Delta P}{6356\ \eta_{fan}} \Rightarrow cfm = \frac{0.75\,hp * 6356 * \eta_{fan}}{\Delta P}$$

- Calculate current fan energy use

Elec

$$E_{fan} = hp * \frac{2545}{Btu/hp} * 8760\ hr/yr * \frac{1\ MBtu}{10^6\ Btu} * 0.75$$

where $hp = \frac{cfm \cdot \Delta p}{6356 \cdot \eta_{fan}}$

Assume fan/motor operate at 75% of rated hp

RS&H®

SUBJECT ECO # 4 AEP NO

SHEET OF

DESIGNER DATE

CHECKER DATE

- Calculate energy use with tank covers and VSDs

Plating operations are active for 1, 2 or 3 shifts five days per week

# shifts	Hours/yr covered	uncovered
1	6240	2520
2	4600	4160
3	2080	6680

With covers in place it is estimated that the cfm will be reduced to 10% of the original flows

Fuel Oil

$$\text{Energy Use} = \frac{CFM_c * HLF_c}{0.80} + \frac{CFM_{uc} * HLF_{uc}}{0.80}$$

where the subscript c and uc represent covered and uncovered events

$$CFM_c = CFM_{uc} \div 10 \qquad CFM_{uc} = \frac{hp * 6356 * \eta_{fan}}{\Delta P}$$

$$HLF_{uc} = HLF_4 - HLF_{\#SHIFTS}$$

Elec

hp varies with the cube of the flow

$$\frac{hp_2}{hp_1} = \left(\frac{cfm_2}{cfm_1}\right)^3 \qquad \frac{hp_2}{hp_1} = \left(\frac{cfm_1 * 0.10}{cfm_1}\right)^3 = 0.001$$

Therefore, if the flow is reduced to 10% of original the hp is reduced to 0.001 times the original hp.

RS&H

SUBJECT ECO #4 AEP NO

SHEET OF

DESIGNER DATE

CHECKER DATE

Energy use = $hp_c * 2545 * 0.75 * H_c +$

$hp_{uc} * 2545 * 0.75 * H_{uc}$

where H = hours
c = covered
uc = uncovered
hp_{uc} = $hp_c * 0.001$
0.75 = fraction of rated hp for actual operation

- Savings equal the difference between the present energy use and use with proposed covers & VSD's.

The following spreadsheet implements these equations.

Small Parts Plating Exhaust Fans

	Exhaust Fan ID	hp	Est. CFM	Supply Fan ID	hp	Tanks Served (IDs)	Type *
Line 1	103	60	47,670	?	?	3,7,8,9,11,15,16,21,22,23,24	PP
	106	10 **	7,945	103	10	14	PP
	107	10 **	7,945	103	10	19	PP
	104	40 **	31,780	103	10	28,29,30	PP
	105	60	47,670	103	10	31,32,33	BL
Line 2	101	25	19,863	101	1.5	3,5,13,16	PP
	102	40	31,780	102	2	19,20,21,30,31	PP
Line 3	108	60 **	47,670	104	?	2,3,4,5,6,7,8,9,10,11,12,13,14	PP
	109	40 **	31,780	-	-	19,20,25,26	BL
Line 4	110	15 **	11,918	-	-	4,5	BL
	111	40 **	31,780	-	-	6,7,8,9,11	BL
	112	10	7,945	-	-	10	BL

*Exhaust system
PP = push-pull
BL = bilateral pull only
**Estimated

	Exhaust Fan ID	# Shifts	# Tanks	Present Use(MBtu/yr) #6 F.O.	N Gas	Elec	Proposed Use (MBtu/yr #6 F.O.	N Gas	Elec	Savings (MBtu/yr) #6 F.O.	N Gas	Elec
Line 1	103	3	11	12,156	0	1,003	8,987	0	767	3,168	0	236
	106	3	1	2,026	0	167	1,498	0	128	528	0	39
	107	3	1	2,026	0	167	1,498	0	128	528	0	39
	104	3	3	8,104	0	669	5,992	0	512	2,112	0	157
	105	3	3	12,156	0	1,003	8,987	0	767	3,168	0	236
Line 2	101	2	4	5,065	0	418	3,745	0	201	1,320	0	217
	102	2	5	8,104	0	669	5,992	0	321	2,112	0	348
Line 3	108	1	13	12,156	0	1,003	8,987	0	296	3,168	0	707
	109	1	4	8,104	0	669	5,992	0	197	2,112	0	472
Line 4	110	3	2	3,039	0	251	2,247	0	192	792	0	59
	111	3	5	8,104	0	669	5,992	0	512	2,112	0	157
	112	3	1	2,026	0	167	1,498	0	128	528	0	39
Totals			53	83,065	0	6,855	61,415	0	4,148	21,650	0	2,707

RS&H®

SUBJECT ECO #4 | AEP NO
SHEET OF
DESIGNER | DATE
CHECKER | DATE

Additional O&M :

Covers should be replaced every five years. On an annual basis assume 1/5th are replaced every year

Annual cost = 1/5 #800 * 53 = #8480/yr

QRIP/OSD PIF CALC'S

Present Cost of Energy

Fuel oil	=	83,065 * 4.40	=	# 365,486
Elec.	=	6855 * 20.35	=	139,499
TOTAL				# 504,985

Proposed

Fuel Oil	=	61,415 * 4.40	=	# 270,226
Elec	=	4148 * 20.35	=	84,412
Total	=			# 354,638

Savings

Fuel Oil	=	21,650 * 4.40	=	# 95,260
Elec	=	2707 * 20.35	=	55,087
Total	=			# 150,347

CONSTRUCTION COST ESTIMATE	DATE PREPARED 8/21/91	SHEET OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: WATERVLIET ARSENAL

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE: ☐ CODE A (No design completed) ☒ CODE B (Preliminary design) ☐ CODE C (Final design) ☐ OTHER (Specify)

DRAWING NO.

ESTIMATOR: P. Hutchins

CHECKED BY

ECO#4 Dip Tank Covers + Exhaust Fan Controllers SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
Dip Tank Cover w MOVEABLE MOUNT	1	EA	300	300	500	500	800
FAN AP							
TRANSDUCER	1	EA	100	100	400	400	500
CONTROLLER			100	100	550	550	650
FAN MOTOR VARIABLE SPEED DRIVE	1	EA	300	300	2800	2800	3100
TOTALS				800		4250	5050

ENG FORM 150 1 AUG 59 (ER 1110-345-730) PREVIOUS EDITION MAY BE USED * U.S. GOVERNMENT PRINTING OFFICE : 1960 O—616168 (TRANSLUCENT)

02/05/92

ECO Construction Cost Estimate
Calculations

ECO Name: DIP TANK COVERS & EXHAUST FAN VSD

ECO #: 4

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$109,700
Labor	$21,900
Subtotal bare costs	$131,600
FICA Insurance (20% of Labor)	$4,380
Sales Tax (not applicable for GOGO)	$0
Subtotal	$135,980
Overhead (15%)	$20,397
Subtotal	$156,377
Profit (10%)	$15,638
Subtotal	$172,015
Bond (1%)	$1,720
Subtotal	$173,735
Contingency (10%)	$17,374
Subtotal (Construction Cost Input For LCCID *)	$191,109
SIOH (6% of Construction Cost)	$11,467
Subtotal	$202,576
Design (6% of Construction Cost)	$11,467
Total Project Cost	$214,043

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE	DATE PREPARED 8/21/91	SHEET OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: WATERVLIET ARSENAL

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify)

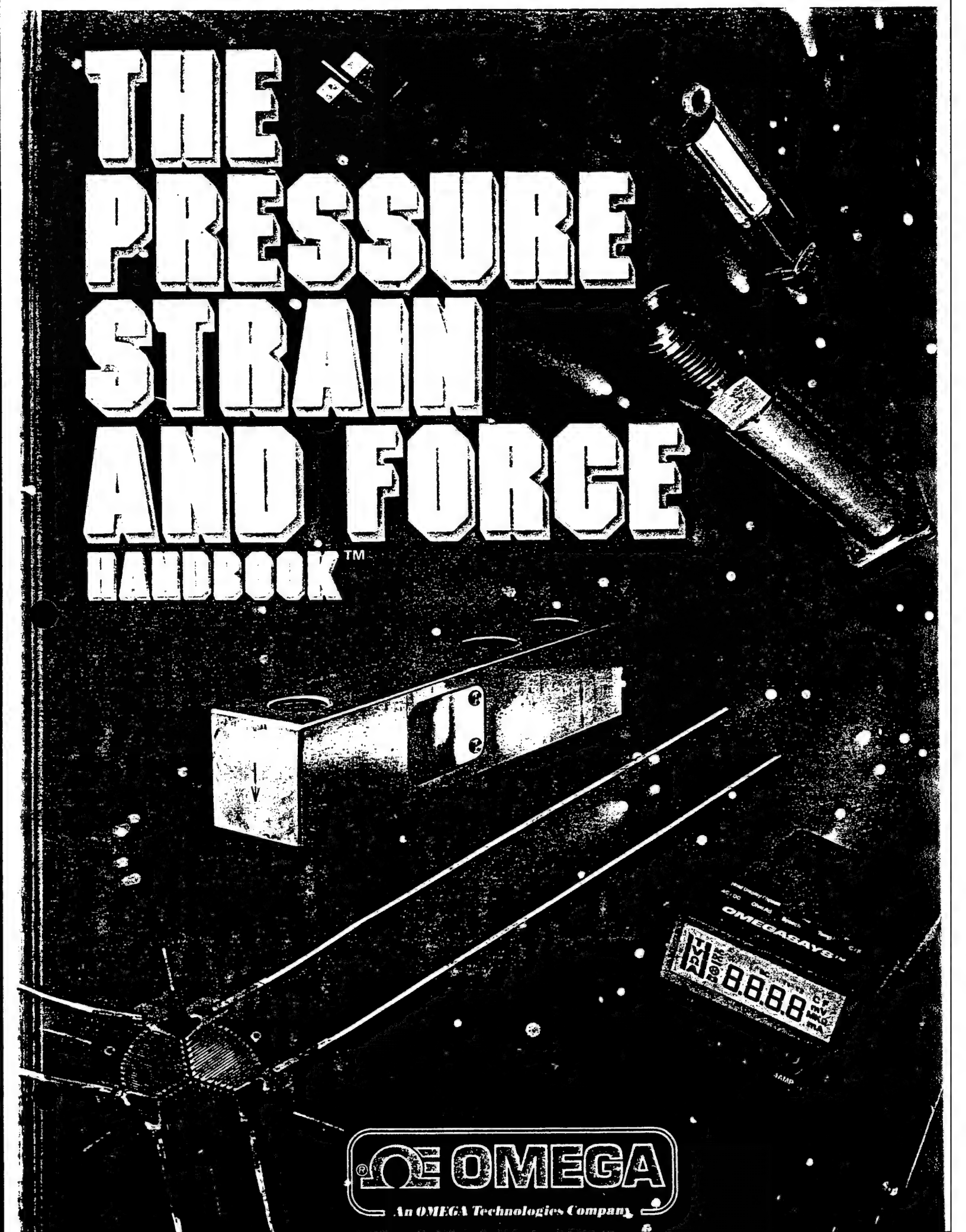
DRAWING NO.

ESTIMATOR: P. HUTCHINS

CHECKED BY

ECO #4 - SUMMARY SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
Dip Tank Covers w/ moveable mount	53	ea	300	15,900	500	26,500	42,400
Fan ΔP TRANSDUCER	12	ea	100	1200	400	4800	6000.
CONTROLLER	12	ea	100	1200	550	6600	7800
FAN MOTOR Variable Speed Drive							
10 Hp	3	ea	300	900	3200	9600	10,500
15 Hp	1	ea	300	300	4000	4000	4300
25 Hp	1	ea	300	300	5000	5000	5300
40 Hp	4	ea	300	1200	6400	25,600	26,800
60 Hp	3	ea	300	900	9200	27,600	28,500
TOTALS				21,900		109,700	131,600

THE PRESSURE STRAIN AND FORCE HANDBOOK™



OMEGA

An OMEGA Technologies Company

LOW PRESSURE DIFFERENTIAL TRANSDUCERS

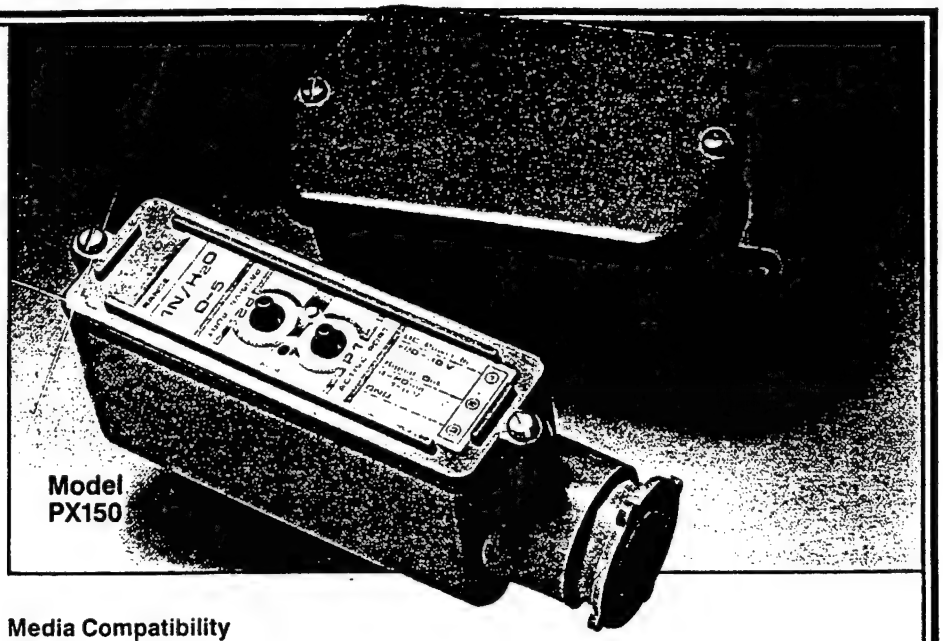
PX150/154 Series 0-1″ to 0-25″ H_2O

MADE IN USA

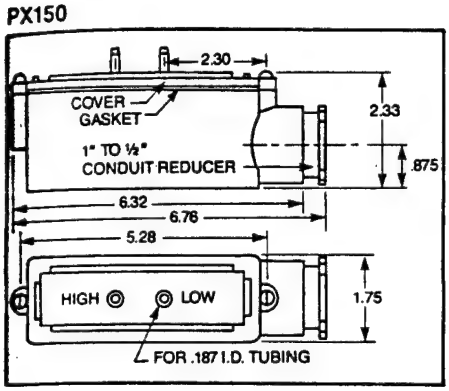
- Weatherproof NEMA-4 Enclosure or Electrical Conduit Enclosure
- Zero and Span Controls Are Provided For Easy Field Adjustment

From

$305



PX150



Media Compatibility

PX150

Low: Dry gases only

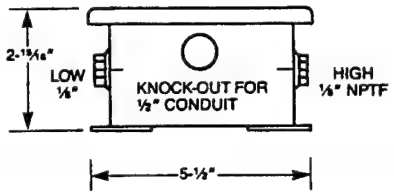
High: Liquids or gases, except highly ionic solutions (acids, lye, etc.)

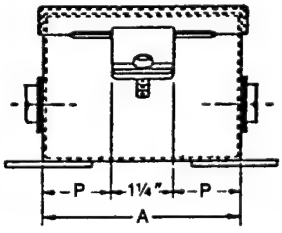
PX154

P1 P2: Non-corrosive, non-aqueous liquids or gases

PX155 : SLIGHTLY CORROSIVE LIQUIDS OR GASES

PX154





SPECIFICATIONS

Excitation: 24 Vdc (18 to 30 Vdc)

Output: 4 to 20 mA, 2 wire system

Maximum Loop Resistance: 400 ohms @ 18 Vdc, 700 ohms @ 24 Vdc, 1000 ohms @ 30 Vdc

Accuracy: (linearity & hysteresis) PX154 0.1% FS; PX150 2.0% FS

Zero and Span Adjustments: ±10%

Compensated Temperature Range: 32 to 122°F (0 to 50°C)

Zero and Span Thermal Effects: PX154 (.311/FS range) % FS/°F; PX150 (3.9/FS range) % FS/°F

Proof Pressure: PX150 3 PSI; PX154 15 PSI

Burst Pressure: PX150 5 PSI; PX154 20 PSI

Gages: Solid state piezoresistive

Cover Material: PX150 PVC-1″ electrical access enclosure; PX154 NEMA-4 gasketed steel enclosure with enamel finish

Pressure Port: PX150 0.187″ diameter tube fitting ports; PX154 ⅛″ NPT female

Electrical Connection: Internal screw terminations

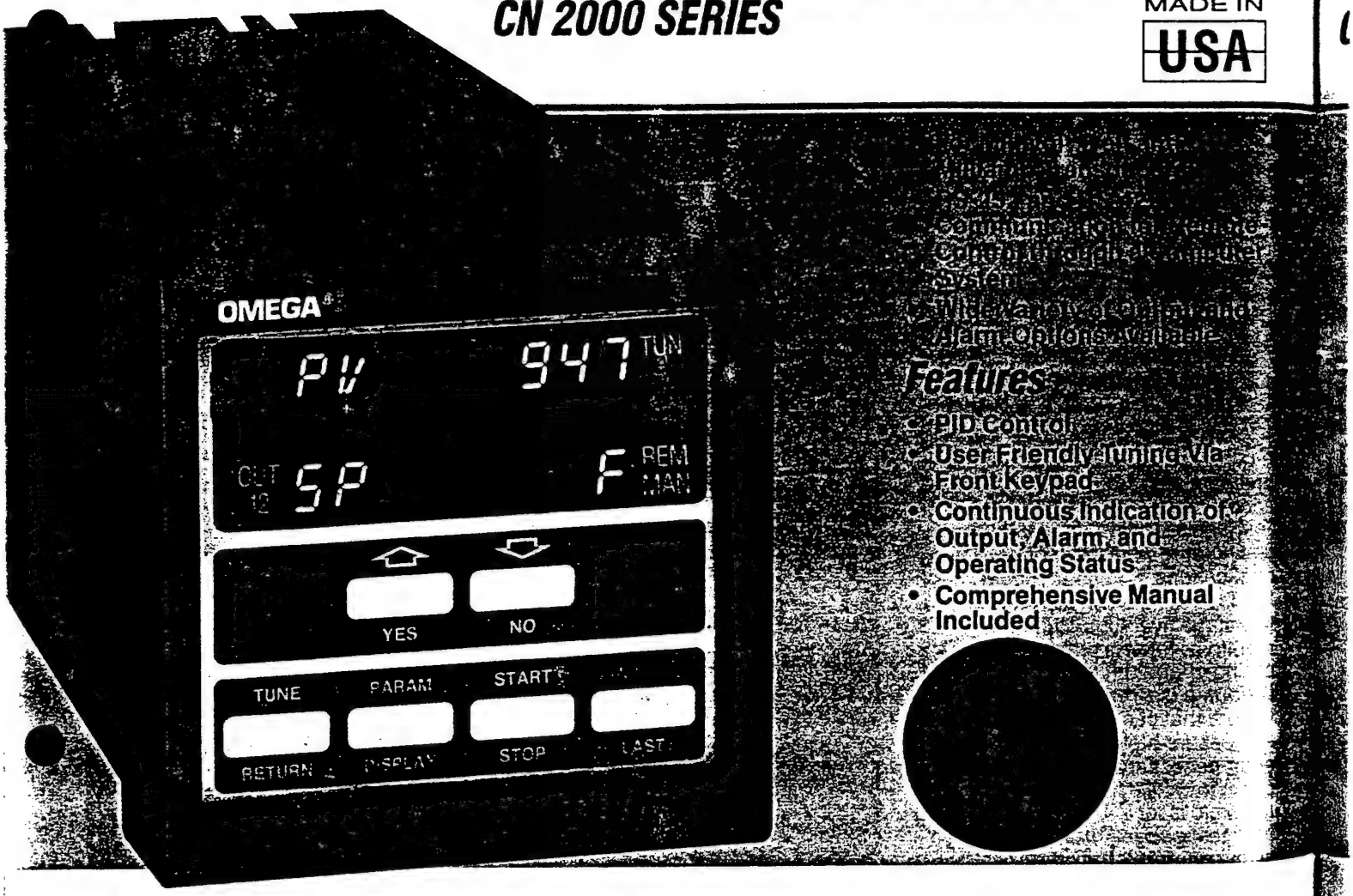
To Order (Specify Model Number)

RANGE Inches of H_2O	MODEL	PRICE	COMPATIBLE METER
NEMA-4 Enclosure Models			
0 to 1″	PX154-001DI	$305	DP100R8, DP2000P9, TX81
0 to 3″	PX154-003DI	305	DP100R8, DP2000P9, TX81
0 to 5″	PX154-005DI	305	DP100R8, DP2000P9, TX81
0 to 10″	PX154-010DI	305	DP100R8, DP2000P9, TX81
0 to 25″	PX154-025DI	305	DP100R8, DP2000P8, TX81
Conduit Enclosure Models			
0 to 1″	PX150-001DI	315	DP100R8, DP2000P9, TX81
0 to 3″	PX150-003DI	315	DP100R8, DP2000P9, TX81
0 to 5″	PX150-005DI	315	DP100R8, DP2000P9, TX81
0 to 10″	PX150-010DI	315	DP100R8, DP2000P9, TX81
0 to 25″	PX150-025DI	315	DP100R8, DP2000P8, TX81

4-10

PROCESS CONTROLLER
CN 2000 SERIES

MADE IN USA



Features

- PID Control
- User Friendly Tuning Via Front Keypad
- Continuous Indication of Output, Alarm, and Operating Status
- Comprehensive Manual Included

To Order (Specify model number)

Model No.	Price	1st Output and Mode	2nd Output and Mode	Alarms
CN2001 (*)	$415	1A SSR PID	—	None
CN2002 (*)	445		1 A SSR, ON/OFF	
CN2001A (*)	465		—	Dual
CN2002A (*)	505		1A SSR, ON/OFF	

*Insert input code. Price includes range premiums.

INPUT TYPES

Code	Range	Type
mA	4-20 mA	Current
mV	0-100 mV dc	Voltage
V5	0-5 V dc	Voltage
V10	0-10 V dc	Voltage

Units factory scaled for 0-100% display. Zero and span field selectable. Max. display is 3200 counts.

OUTPUT OPTIONS

Ordering Suffix	Price	Description
-F1	N/C	4-20mA, output 1, reverse
-F2	N/C	4-20mA, output 2, direct
-DC1	N/C	0-5 Vdc, output 1, reverse
-DC2	N/C	0-5 Vdc, output 2, direct

EXCITATION OPTIONS*

Excitation	Code	Price	Description
*Not Available with Options D2-D6 or Model CN2000A.			
5 V dc	X5 V	$50	5 V dc @ 40 mA
10 V dc	X10 V	50	10 V dc @ 100 mA

COMMUNICATION OPTIONS

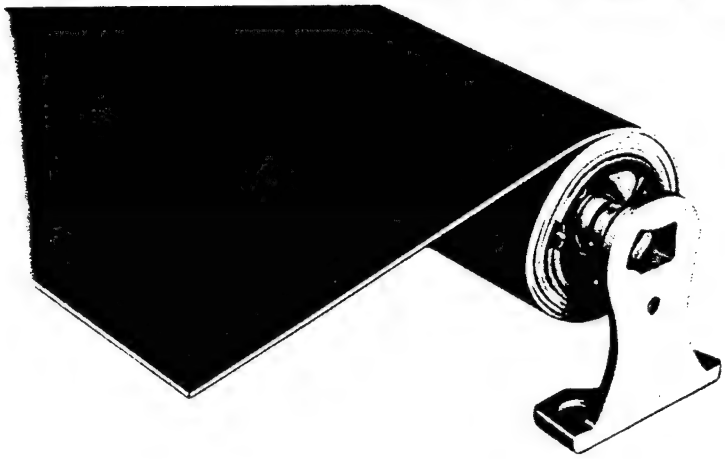
Code	Price	Description
D1	$ 50	remote analog setpoint (n/a with 2000A)
D2	195	non-isolated RS-232C
D3	195	isolated RS-232C
D4	195	non-isolated RS-422
D5	195	isolated RS-422
D6	195	isolated 20 mA loop
D7	50	remote start/stop (N/A with 2000A)

Also Available Auto/Manual Output Control. To Order, Add Suffix AM to Model No., and Add $50 to Price.

GORTITE

SHADE ROLLER COVERS

PROTECT WAYS AGAINST CHIPS AND COOLANTS

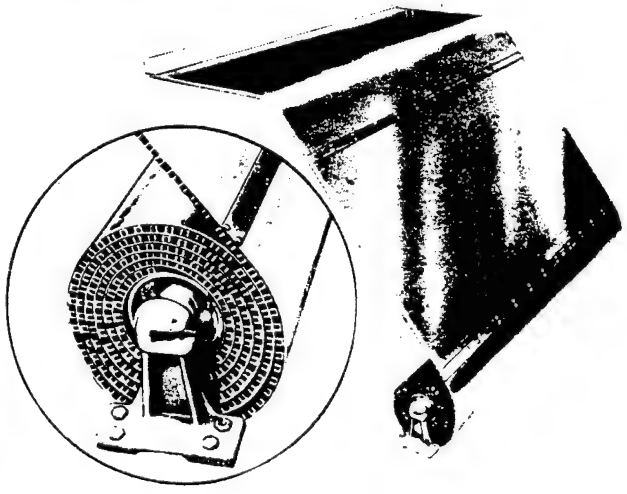


GORTITE **SHADE ROLLERS AND COVERS ARE AVAILABLE FOR ALL APPLICATIONS THAT REQUIRE PROTECTION FROM CHIPS, ABRASIVES, OIL AND COOLANTS WITHOUT THE SEAL OF A BELLOWS COVER. VARIOUS DIAMETER SPRING LOADED METAL ROLLERS ARE AVAILABLE WITH COVER MATERIALS TO SUIT THE SIZE AND SEVERITY OF THE APPLICATION.**

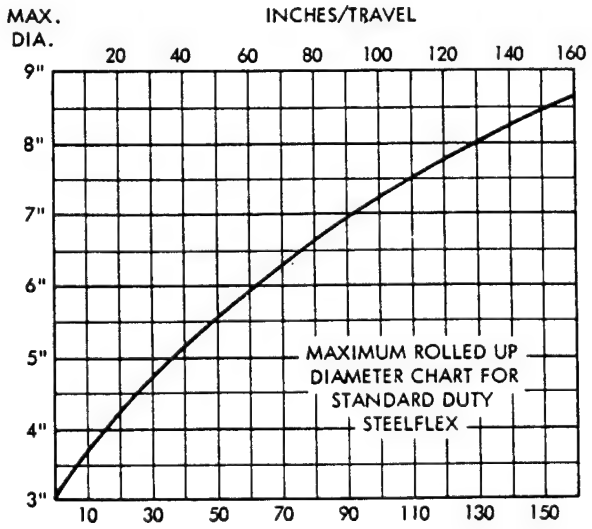
DESCRIPTION OF COVER MATERIALS

COVER MATERIALS *	DESCRIPTION
18NN	.018 GAUGE NEOPRENE COATED NYLON - FOR LIGHT DUTY PROTECTION AGAINST COOLANTS AND CHIPS
33NN	.033 GAUGE NEOPRENE COATED NYLON - FOR MODERATE DUTY PROTECTION AGAINST COOLANTS AND CHIPS
60HN	.060 GAUGE HYPALON COATED NYLON - HEAVY DUTY PROTECTION AGAINST ABRASION, COOLANT, AND CHIPS INCLUDING MODERATE HOT CHIP LOADS
STANDARD DUTY STEELFLEX	CONTINUOUS STAINLESS STEEL TOP SURFACE WITH SUPPORTING ALUMINUM RIBS. FOR HEAVY DUTY PROTECTION AGAINST LARGE CHIP LOADS, COOLANT, HOT CHIPS, ETC.

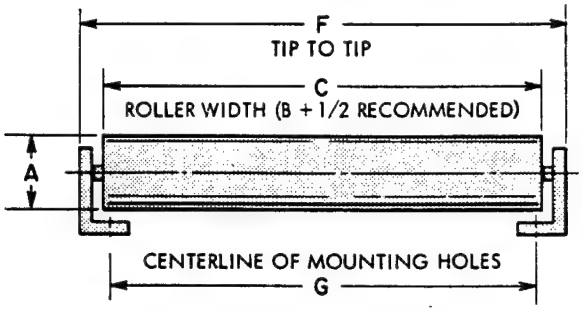
*SPECIAL MATERIALS AVAILABLE UPON REQUEST.

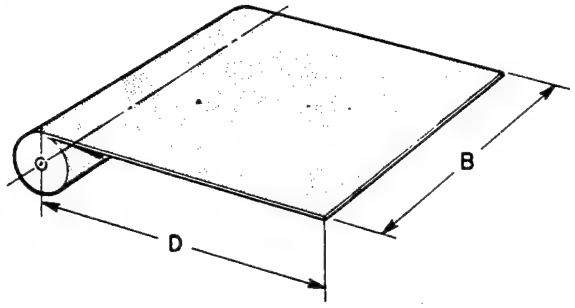


STANDARD DUTY STEELFLEX ON SPRING LOADED ROLLER



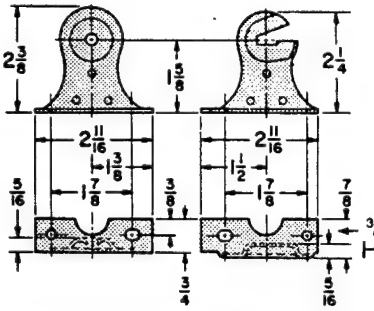
ROLLER DIMENSIONS AND COVER MATERIALS



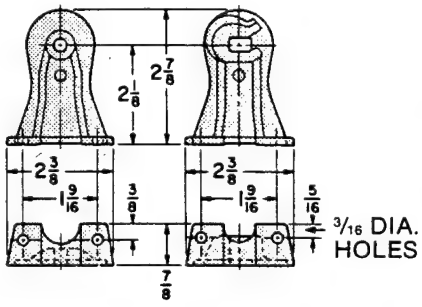


ROLLER DIAMETER	TIP TO TIP	CENTERLINE OF MTG. HOLES	COVER MATERIALS AVAILABLE ON VARIOUS ROLLER DIAMETERS			
A	F	G	18NN	33NN	60HN	STD. DUTY STEELFLEX
1-1/2"	C + 1-1/8"	C + 1/8"	X			
2" HD	C + 1-5/16"	C + 5/16"	X	X	X	
3" HD	C + 1-1/2"	C-1 1/4", C + 1/2"	X	X	X	X

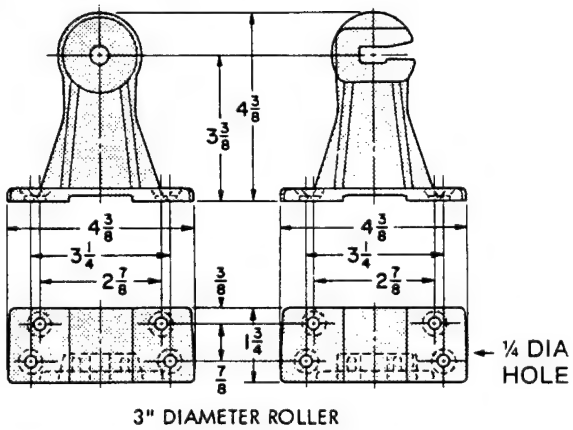
DIMENSIONS OF ROLLER MOUNTING BRACKETS



1-1/2" DIAMETER ROLLER



2" DIAMETER ROLLER



3" DIAMETER ROLLER

HOW TO ORDER

TO ORDER OR FOR QUOTATION, PLEASE SPECIFY THE FOLLOWING DIMENSIONS AND INFORMATION.

A ROLLER DIAMETER _____

B COVER WIDTH _____
(WAY WIDTH + 2" RECOMMENDED)

C ROLLER WIDTH _____
(COVER + 1/2" RECOMMENDED)

D MAX. OPEN LENGTH OF COVER _____
(FOR _____ MACHINE TRAVEL)

MAX. MACHINE TRAVEL SPEED _____ IN./MIN.

COVER MATERIAL PREFERRED
_____ 18NN _____ 33NN _____ 60HN
_____ STANDARD DUTY STEELFLEX _____ OTHER
_____ WITH _____ WITHOUT MOUNTING BRACKETS

DATE _____ FOR QUOTATION ONLY _____
QUANTITY REQUIRED _____
DATE REQUIRED _____
ORDER NUMBER _____
COMPANY NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
ATTENTION _____

PLEASE BE SURE YOU HAVE FILLED IN AS MUCH OF THE REQUESTED INFORMATION AS IS AVAILABLE.

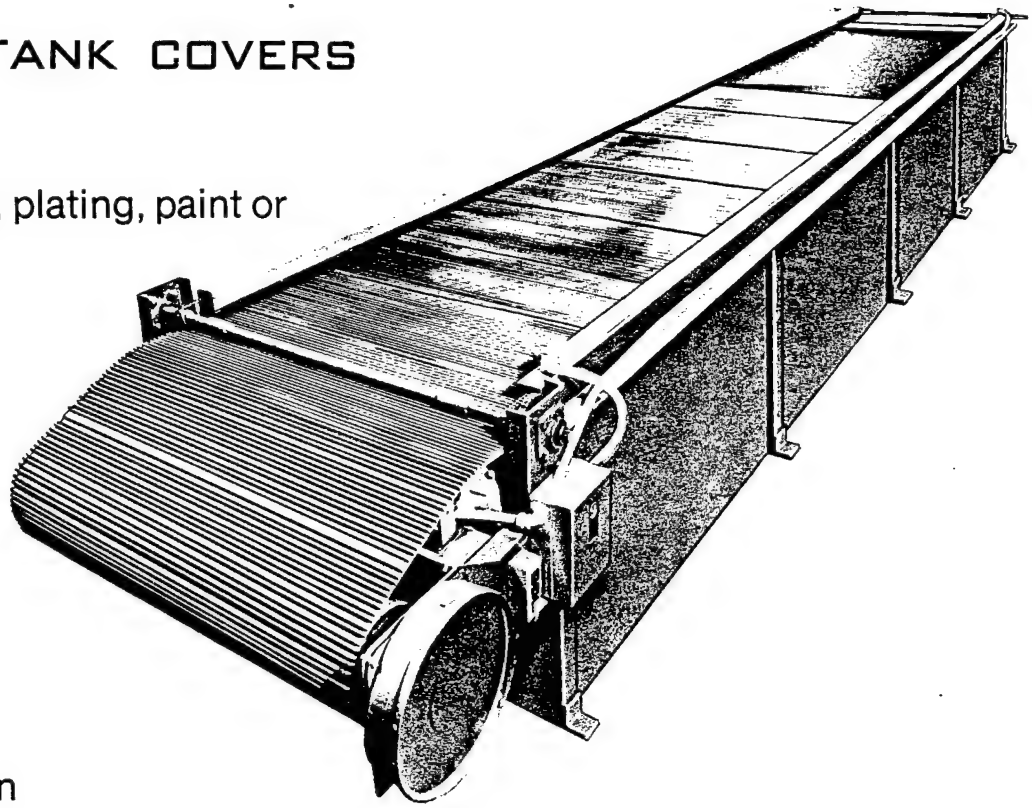
A and A Manufacturing Company 2300 So. Calhoun Rd., New Berlin, Wis. 53151 • Phone 414-786-1500

4-13

STEELFLEX®

MOTOR-DRIVEN TANK COVERS

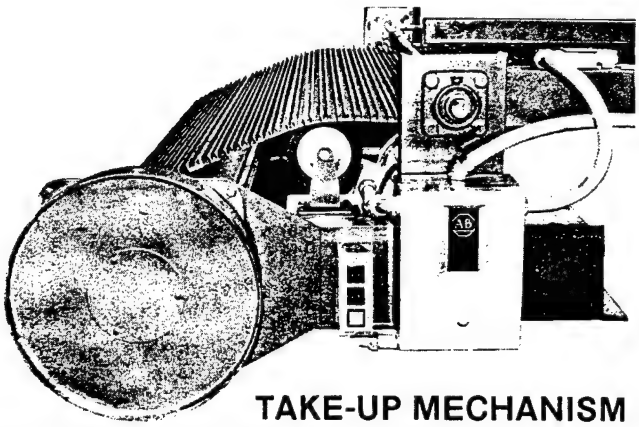
for chemical, degreasing, plating, paint or any other type of tank



- Protect Personnel
- Control Evaporative Emissions For Energy Savings
- Prevent Contamination
- Contain Dangerous Fumes

CONSTRUCTION

STEELFLEX motor-driven tank covers are designed to provide a complete system for covering all types of tanks. Steelflex covers are made of continuous stainless steel surface reinforced with aluminum, steel or stainless steel support ribs which allow personnel to walk on the cover. The support ribs are bonded to top for strong, durable construction. Stainless steel or aluminum guide channels can be provided for the sides of the tank to contain the cover. Tank covers can be furnished stainless steel side on top or bottom. Any tank width or length can be accommodated.



TAKE-UP MECHANISM

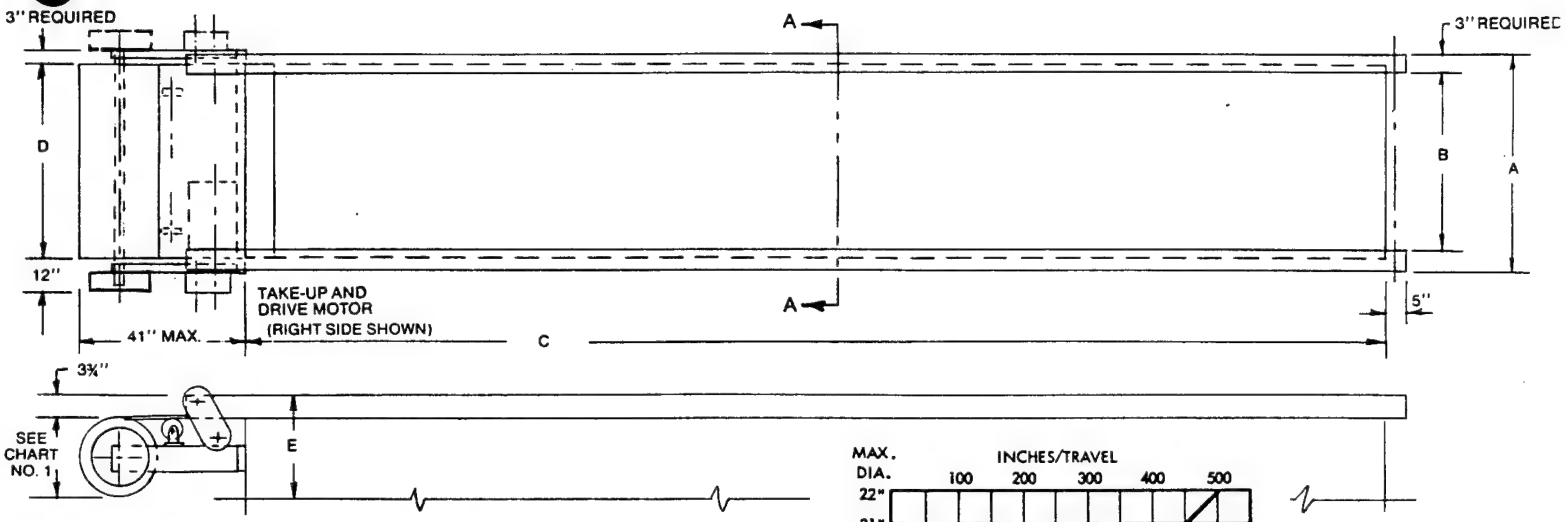
Steelflex Tank Covers are supplied with electric motor drive and take-up mechanism with electrical control for forward, reverse and stop.

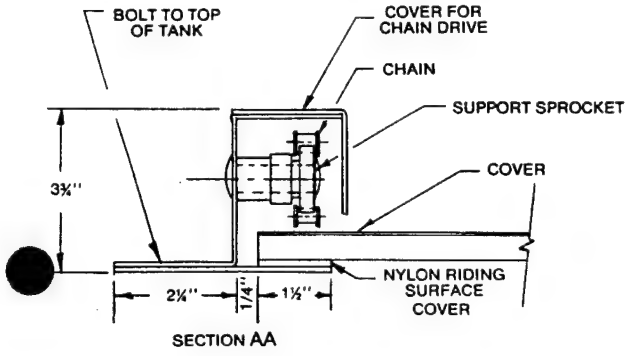
GORTITE

A and A Manufacturing Co. Inc.
2300 South Calhoun Road
New Berlin, WI 53151 Phone 414-786-1500

STEELFLEX® MOTOR-DRIVEN

TANK COVERS DATA SHEET





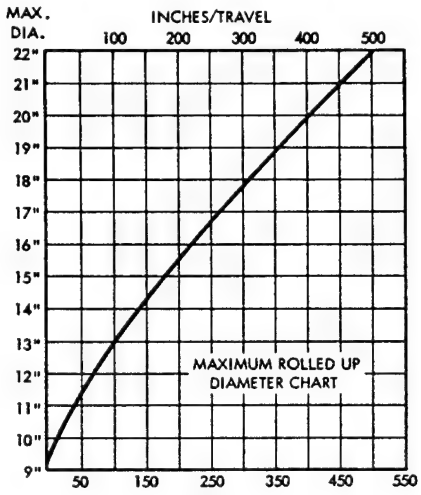


CHART NO. 1

HOW TO ORDER

TO ORDER OR FOR QUOTATION, PLEASE SPECIFY THE FOLLOWING DIMENSIONS AND INFORMATION.

A. OVERALL TANK WIDTH _____

B. INSIDE TANK WIDTH _____

C. OVERALL TANK LENGTH (INSIDE) _____

D. COVER WIDTH _____

E. TANK HEIGHT ABOVE FLOOR _____

SUBSTANCE BEING COVERED _____

TAKE-UP & DRIVE MOTOR LOCATION

RIGHT SIDE _____ LEFT SIDE _____

MOTOR STARTER VOLTAGE REQUIRED

_____ VOLT _____ PHASE

DATE _____ FOR QUOTATION ONLY _____

QUANTITY REQUIRED _____

DATE REQUIRED _____

ORDER NUMBER _____

COMPANY NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

ATTENTION _____

TELEPHONE _____

A and A Manufacturing Co. Inc.
2300 South Calhoun Road
New Berlin, WI 53151 Phone 414-786-1500

4-15

PLEASE BE SURE YOU HAVE FILLED IN AS MUCH OF THE REQUESTED INFORMATION AS IS AVAILABLE.

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.	REQUIREMENT CONTROL SYMBOL DD-M(R) 1561	
	5. DOD COMP NAME: Army	6. DOD COMP CODE: A
	7. COMMAND CODE: W73QKK	8. DATE:

2. TO:	3. THRU:	4. FROM:
HQ. DA (EACA-RMP) Rm 3B719 (Pentagon) Washington, DC 20310-2070	CDR, AMC (AMCRM-MP) 5001 Eisenhower Avenue Alexandria, VA 22333-0001	CDR, AMCCOM Attn: AMSMC-MGP-P (R) Rock Island, IL 61299-6000

9. PROJECT TITLE
Install High-Efficiency Motors (ECO #10)

10. TYPE OF PROJECT *(Check one)*
☐ QRIP ☒ OSD PIF ☐ PECIP

11. AMORTIZATION YEARS/MONTHS
$ 117,500 (Project Cost) ÷ 33,000 (Average Annual Savings) x 12 (No. Mos)
= 3.6 (years) or _____ (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR
024

13. ECONOMIC LIFE
25 years

14. EXPECTED OPERATIONAL DATE

15. SUBMITTING UNIT(S)	16. UNIT ID CODE
Commander Watervliet Arsenal Attn: SMCWV-FE (W. Face) Building 120 Watervliet, NY 12189	WOK9AA

17. PROJECT DESCRIPTION
Install high-efficiency motors for the fans and pumps in two plating areas located in Building 35--Small parts plating and medium gun tube plating.

18. DETAILED JUSTIFICATION
High-efficiency electric motors use less energy than standard motors while operating under identical loads.

19. SAVINGS DISPOSITION
Savings are used to reduce energy expenditures.

20. OTHER REMARKS *(Continue on page 5, if more space is needed)*

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. **SUMMARY OF DOLLAR SAVINGS**
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* Electricity	$533,800	$500,900	$500,900	$500,900	$500,900	$33,000	$33,000	$33,000	$33,000
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	**$533,800**	**$500,900**	**$500,900**	**$500,900**	**$500,900**	**$33,000**	**$33,000**	**$33,000**	**$33,000**

b. **PRIORITIZATION**

(1) **INTERNAL RATE OF RETURN** *(IRR)*

Divide estimated project cost $117,500 by average annual savings $33,000 = 3.6 factor. Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 35 % IRR.

(2) **SAVINGS TO INVESTMENT RATIO (S/I)**

Multiply annual savings $33,000 X discount factor 9.524 = 314,292 and divide by present value of investment *(undiscounted)* 117,500 = 2.7 *S/I.*

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) **RATE OF INVESTMENT PER MANPOWER SPACE** *(RIMS)*

Divide estimated project cost -- by number of manpower space savings -- = -- RIMS. *(Manpower requirements cannot be used in this computation.)*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)–Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1) High-Efficiency Electric Motors		$117,500	1	$117,500		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION *(Equipment delivery)*						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER *(Specify):*						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$117,500		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$117,500		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]				--		
(16) **TOTAL** *(Sum of (14) + (15) above)*				$117,500		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*
[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*
[3] *Normally not OPA funded.*
[4] *Used to compute amortization in Item 11.*
[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)–Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
a	*b*	*c*	*d*	*e.* FROM	*f.* TO	*g.* FROM	*h.* TO	*i.* FROM	*j.* TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower), e.g.,* CONTRACT COSTS & UTILITIES			$33,000						
(8)									
(9)									
(10)									
(11) **TOTAL DOLLAR SAVINGS**			**$33,000**						

6
(1) US Graded
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7]*Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Page 4 of DA Form 5108-R

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)–Continued.

24. REGULATORY APPROVAL/COORDINATION		
a. INVESTMENT STATEMENT **This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints.** _____ *(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)*		
b. OTHER COORDINATION *(Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)* _____ _____		
25. SUBMITTED BY *(Typed name, grade and title of Subordinate Command/Agency or Project Initiator)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON
26. APPROVAL RECOMMENDED BY *(MACOM/Agency)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		
27. APPROVED BY	SIGNATURE	DATE *(YYMMDD)* AUTOVON
20. OTHER REMARKS *(Cont'd)*		

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--(Continued).

RS&H®

SUBJECT ECO 10
ENERGY EFFICIENT MOTORS
DESIGNER C. WARREN
CHECKER R. Hutchins

AEP NO 290-0379-002
SHEET 1 OF
DATE 9/9/91
DATE

BLDG 35

Replace motors in small parts plating line and medium tube plating line w/ energy-efficient ones.

ASSUMPTIONS:

(1) Consider motors for fans, pumps, blowers ≥ 3 HP

(2) Motors run 24 HR/DA, 7 DA/WK, 52 WK/YR, MED TUBE PLATING

⇒ 8760 HRS/YR

RUN 24 HR/DA, 5 DA, WK, 52 WK/YR, SMALL PARTS PLATING
⇒ 6240 HRS/YR

(3) Labor charges are doubled to account for old motor removal time

CALCULATIONS

Preliminary screening calculation using spreadsheet on following page (10-2). Material costs from Reliance 1991 catalog - labor from 1991 Means

⇒ Consider motors ≤ 100 HP ONLY

3/92

ECO #10 - WATERVLIET ARSENAL
INSTALL ENERGY EFFICIENT MOTORS
FILENAME: REPEEM
DATE: 29 AUG 91 OPERATING HOURS = 6000

MOTOR SIZE (HP)	LIST PRICE RELIANCE ENERGY-EFF. ENCLOSED (1991$)	CONTRACTOR RELIANCE ENERGY-EFF. ENCLOSED (1991$)	LABOR REMOVE OR INSTALL MOTOR (1991$)	MAT'L & LABOR PRICE W/ MARKUPS (1991$)	EFFICIENCES RELIANCE STD MOTOR NOM. EFF. (%)	EFFICIENCES RELIANCE ENERGY-EFF. ENCLOSED (%)	ENERGY SAVINGS (KWH/YR)	COST SAVINGS ($/YR)	SIMPLE PAYBACK (YRS)
3	395	296	45	609	77.0%	87.5%	2093	142	4.3
5	478	359	45	703	81.3%	88.5%	2256	153	4.6
8	636	477	48	892	82.0%	89.8%	3556	241	3.7
10	795	596	50	1079	84.0%	90.2%	3663	248	4.3
15	1042	782	63	1406	84.8%	90.9%	5360	363	3.9
20	1345	1009	77	1799	85.8%	91.7%	6774	459	3.9
25	1608	1206	80	2107	86.3%	92.3%	8504	576	3.7
30	1905	1429	84	2457	88.0%	92.7%	7737	524	4.7
40	2563	1922	100	3259	88.0%	93.3%	11557	783	4.2
50	3207	2405	125	4077	89.3%	93.3%	10745	728	5.6
60	4487	3365	145	5596	89.3%	93.1%	12444	843	6.6
75	5820	4365	170	7193	90.3%	94.0%	14839	1005	7.2
100	7140	5355	225	8884	90.6%	94.5%	20389	1382	6.4
125	9275	6956	285	11514	92.3%	94.9%	16608	1125	10.2
150	10942	8207	335	13579	91.7%	95.1%	26176	1774	7.7
200	12961	9721	400	16096	93.0%	95.1%	21256	1440	11.2
250	16652	12489	450	20448	93.6%	95.4%	22557	1528	13.4
300	17748	13311	500	21868	94.1%	95.6%	22390	1517	14.4

ASSUMPTIONS: CONTRACTORS DISCOUNT FACTOR = 0.65 FOR STANDARD DUTY, 0.75 FOR ENERGY EFFICIENT
MOTORS ARE TOTALLY ENCLOSED,T-FRAME, 1800 RPM, 460 VOLT, 3 PHASE
SAVINGS = HP * 0.746*[(1/ST EFF)-(1/EN EFF)] * HRS/YR * ELECOST
OPERATING TIMES: 24 HR/DA
5 DA/ 6000 HRS/YR
ELECTRICITY COST: AVERAGE OF ENERGY & DEMAND CHARGES $0.0678 /KWH

8/92

RS&H®

SUBJECT ECO 10
Energy Efficient Motors
DESIGNER C Warren
CHECKER

AEP NO 290-0379-002
SHEET ____ OF ____
DATE 9/9/91
DATE ____

- Motor list taken from WVA Property Records

  WV 12110 - Small parts plating

  WV 12050 - Medium tube plating

- KW(SAVINGS) = HP * 0.746 * (1/STD EFFICIENCY - 1/ENERGY EFFICIENCY)

- AVG ELECT COST = $20.35 / MBtu

8/92

WATERVLIET ARSENAL
ECO#10 - INSTALL ENERGY EFFICIENT MOTORS

WV 12110 SMALL PARTS PLATING

			PRESENT METHOD			FUTURE METHOD			SAVINGS	
			ENERGY USE			ENERGY USE				
NO.	HP	HP	(KW)	(MBTU/YR)	($/YR)	(KW)	(MBTU/YR)	($/YR)	(MBTU/YR)	($/YR)
3	3	9	8.7	186	$3,779	7.7	163	$3,326	22	$453
3	5	15	13.8	293	$5,969	12.6	269	$5,480	24	$489
3	7.5	22.5	20.5	436	$8,871	18.7	398	$8,101	38	$771
11	10	110	97.7	2,081	$42,339	91.0	1,938	$39,429	143	$2,910
1	15	15	13.2	281	$5,722	12.3	262	$5,335	19	$387
1	20	20	17.4	371	$7,541	16.3	347	$7,052	24	$489
4	25	100	86.5	1,842	$37,486	80.8	1,721	$35,029	121	$2,457
2	30	60	50.9	1,083	$22,044	48.3	1,028	$20,926	55	$1,118
5	40	200	169.5	3,611	$73,480	159.9	3,406	$69,306	205	$4,174
2	60	120	100.3	2,136	$43,471	96.2	2,048	$41,673	88	$1,798
35		672	578.5	12,320	$250,702	543.7	11,580	$235,656	739	$15,046

WV 12050 MEDIUM TUBE PLATING

			PRESENT METHOD			FUTURE METHOD			SAVINGS	
		TOTAL	ENERGY USE			ENERGY USE				
NO.	HP	HP	(KW)	(MBTU/YR)	($/YR)	(KW)	(MBTU/YR)	($/YR)	(MBTU/YR)	($/YR)
4	3	12	8.7	261	$5,305	7.7	229	$4,669	31	$637
6	5	30	27.5	824	$16,759	25.3	756	$15,386	67	$1,373
4	7.5	30	27.3	816	$16,605	24.9	745	$15,163	71	$1,442
2	15	30	26.4	790	$16,067	24.6	736	$14,980	53	$1,087
12	20	240	208.8	6,242	$127,034	195.2	5,837	$118,792	405	$8,243
3	40	120	101.7	3,041	$61,893	95.9	2,869	$58,377	173	$3,516
1	60	60	50.2	1,499	$30,513	48.1	1,437	$29,251	62	$1,262
32		522	450.6	13,473	$274,176	421.8	12,610	$256,617	863	$17,559

TOTALS

67		1193.5	1,029	25,793	$524,879	966	24,190	$492,273	1,602	$32,605

ELECTRICITY PRICE = $20.35 /MBTU
OPERATING HOURS PER YEAR MEDIUM TUBE PLATING = 8760
SMALL PARTS PLATING = 6240

8/92

02/05/92

ECO Construction Cost Estimate
Calculations

ECO Name: ENERGY EFFICIENT MOTORS

ECO #: 10

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$63,817
Labor	$9,038
Subtotal bare costs	$72,855
FICA Insurance (20% of Labor)	$1,808
Sales Tax (not applicable for GOGO)	$0
Subtotal	$74,663
Overhead (15%)	$11,199
Subtotal	$85,862
Profit (10%)	$8,586
Subtotal	$94,448
Bond (1%)	$944
Subtotal	$95,392
Contingency (10%)	$9,539
Subtotal (Construction Cost Input For LCCID *)	$104,931
SIOH (6% of Construction Cost)	$6,296
Subtotal	$111,227
Design (6% of Construction Cost)	$6,296
Total Project Cost	$117,523

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE	DATE PREPARED 9-6-91	SHEET 1 OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: WVA

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify)

DRAWING NO.

ESTIMATOR: C. WARREN

CHECKED BY: R. Hutchins

MOTORS WV12110 SUMMARY SMALL PARTS PLATING	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
HP							
3	3		90	270	296	889	1159
5	3		90	270	359	1076	1346
7.5	3		96	288	477	1431	1719
10	11		100	1100	596	6559	7659
15	1		126	126	782	782	908
20	1		154	154	1009	1009	1163
25	4		160	640	1206	4824	5464
30	2		168	336	1429	2858	3194
40	5		200	1000	1922	9611	10611
60	2		290	580	3365	6731	7311
	35			4764		35768	40,532
WV 12050 MED. TUBE PLATING							
3	4		90	360	296	1184	1544
5	6		90	540	359	2154	2694
7.5	4		96	384	477	1908	2292
15	2		126	252	782	1564	1816
20	12		154	1848	1009	12108	13956
40	3		200	600	1922	5766	6366
60	1		290	290	3365	3365	3655
	32			4274		28049	32323
TOTALS —	67			9,038		63,817	72,855

ECIP

FORM 1391

ECIP 1 - HIGH EFFICIENCY LIGHTING

1. COMPONENT	FY 19 96 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		2 April 92

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Watervliet Arsenal, New York	High Efficiency Lighting (ECIP)

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	80000		430

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Primary Facility				369
32W T8 Fluorescent Lamps	ea	308	$ 6.13	(2)
Electronic Ballasts for 32W Lamps	ea	102	69.67	(7)
34W Fluorescent Lamps	ea	7845	5.75	(45)
60W Fluorescent Lamps	ea	6248	8.88	(56)
Electronic Ballasts for 60W Lamps	ea	3124	83.05	(259)
Subtotal				369
Contingency (10%)				37
Total Contract Lost				406
SIOH (6%)				24
Total Request				430

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Fluorescent lamps and ballasts will be replaced in fixtures throughout the installation. In non-production areas standard 40W lamps are replaced by 34W lamps. In production areas 40W lamps and standard ballasts are replaced by 32W T8 lamps and electronic ballasts; 80W lamps and standard ballasts are replaced by 60W lamps and electronic ballasts. This project also calls for participation in the Niagara-Mohawk Power Corporation rebate program on fluorescent lamps and ballasts.

Annual savings are 5184 MBtu/yr of electricity or $105,500/yr. The SIR is 3.6 and payback is 4.3 years.

1. COMPONENT	FY 1996 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		3 April 92

3. INSTALLATION AND LOCATION	
Watervliet Arsenal, New York	
4. PROJECT TITLE	**5. PROJECT NUMBER**
High Efficiency Lighting (ECIP)	

11. QUANTITATIVE DATA, JUSTIFICATION, AND ADDITIONAL DATA

Requirement:	-0-	LS
Substandard:	-0-	LS
Adequate:	-0-	LS

Project:

The proposed project calls for replacements of standard lighting system components to high efficiency types.

Requirement:

This project is required to reduce energy consumption at Watervliet Arsenal (WVA) pursuant to Executive Order 12003 and 12759.

Current Situation:

Energy is being wasted at WVA due to inefficiencies in the fluorescent lighting system.

Impact If Not Provided:

If the proposed project is not funded, energy waste will continue at WVA due to inefficiencies in the fluorescent lighting.

_____

Installation Commander

Estimated Construction:	April 1996	Index:	2072
Estimated Midpoint of Construction:	May 1996	Index:	2078
Estimated Construction Completion:	June 1996	Index:	2084

DETAILED PROJECT JUSTIFICATION

1. General:

The proposed project will reduce energy consumption at Watervliet Arsenal (WVA) increasing the efficiency of the fluorescent lighting systems. The result is that less energy will be required to provide lighting.

2. Accommodations Now in Use:

Numerous permanent structures.

3. Analysis of Deficiency:

The fluorescent lighting at WVA uses standard lamps and ballasts. Implementing this project will improve the efficiency of the lighting systems.

4. Consideration of Alternatives:

Alternatives were considered and evaluated. The most cost-effective solutions were recommended.

5. Criteria for Proposed Construction:

The proposed project will conform with all Federal and U.S. Army regulations.

6. Program for Related Furnishings and Equipment:

No furnishings or equipment funded from appropriations other than MCA are required.

7. Disposal of Present Assets:

No buildings will be disposed.

8. Survival Measures:

This project is not suitable for inclusion for protective shelter.

9. Summary of Environmental Consequences:

Ballasts may contain PCBs and should be properly disposed. WVA has an existing program for ballast disposal.

10. Evaluation of Flood Hazards and Encroachment on Wetlands:

These facilities are not located in a flood plain and do not encroach on wetlands.

11. Economic Justification

The ECIP Economic Analysis Summary is attached.

12. Utility and Telecommunication Support:

No related utility support is programmed. The existing utility systems are adequate.

No telecommunications support is required. Coordination has been made between the DEH and USACC as authenticated by:

_____ _____

Date

13. Protection of Historic Places and Archeological Sites:

Review procedures have been implemented for this project in accordance with 36 CFR Part 800, "Procedures for the Protection of Historic and Cultural Properties." The review has established that there will be no adverse effect.

14. Project Development Brochure (Part 1):

A PDB is provided in a separate document.

15. Energy Requirements:

An Energy Requirements Appraisal has been prepared for this project and is attached (ERA in SRP-3).

16. Provisions for the Handicapped:

No provisions for the handicapped will be made since the scope of this project is in no way applicable to designing for the handicapped.

17. Real Property Maintenance Activity (RPMA):

No additional RPMA will be required.

18. Commercial Activities:

This project has been reviewed considering the requirements of commercial and industrial type facilities, and it has been determined that whereas this project does not affect commercial facilities, those requirements do not apply.

SRP-3, ENERGY REQUIREMENT APPRAISAL

1. Project Description:

   a. Installation: Watervliet Arsenal, New York

   b. Project No.:

   c. Project Title: High Efficiency Lighting

   d. Geographical Location: New York

   e. Physical Description: Replacement of standard fluorescent lamps and ballasts with high efficiency types.

2. Estimated Energy Consumption:

   It is estimated that the proposed system will result in a net decrease in energy consumption of 5184 MBtu/yr.

3. Energy Sources:

   No additional energy sources will be required as a result of implementing this project.

4. Energy Use Impacts:

   All the existing utility systems will support the energy requirements without system expansion.

5. Energy Conservation:

   It is estimated that the proposed system will result in a net decrease in energy consumption of 5184 MBtu/yr.

6. Energy Alternatives:

   An investigation revealed that no energy alternatives exist which might reduce total demand or reduce loading on critical energy sources.

7. Energy Effects:

   No adverse environmental effects are anticipated. Degradation of environmental standards will not allow the use of more efficient energy sources.

8. Basis of Appraisal:

   In consideration of energy sources and energy requirements, total energy and selective energy have been considered and disregarded as inapplicable.

PROJECT DEVELOPMENT BROCHURE

ECIP-1 - HIGH EFFICIENCY LIGHTING

installation: Watervliet Arsenal

project: High Efficiency Lighting (ECIP)

project number
temporary: _____ program year FY 96

permanent: _____ category code 80000

point of contact:

user
name William B. Face date 3 April 1992

title Energy Coordinator phone 518/266-4228

autovon _____

dfae
name R. G. Wells date 3 April 1992

title Director, Engineering & Housing phone 518/266-4228

autovon _____

engineer district
name _____ date _____

title _____ phone _____

autovon _____

other (A-E)
name _____ date _____

title _____ phone _____

autovon _____

reviewed by:

installation facility engineer
name R. G. Wells date 3 April 1992

title Director, Engineering & Housing phone 518/266-4228

autovon _____

approved by:

macom engineer
name _____ date _____

title _____ phone _____

autovon _____

project development brochure, PDB-1

DA FORM 5020-R, Feb 82

facility

Buildings:

10, 15, 20, 21, 23, 24, 25, 40, 44, 110, 115, 120, 124, 125, 130, 145

project coordinator for using service

William B. Face

518/266-4226

functional requirements summary, PDB-1

This project is required to meet stated goals of energy use reduction pursuant to Executive Order 12003 and 12759. It is submitted as part of the Energy Conservation Investment Program (ECIP).

The objective of this project is to improve the efficiency of the WVA fluorescent lighting systems. Existing fluorescent fixtures use standard lamps and ballasts. This project replaces 40 watt lamps in non-production areas with 34 watt lamps; 40 watt fluorescent lamps and standard ballasts in production areas with 32 watt T8 lamps and electronic ballasts; and 80 watt lamps and standard ballasts in production areas with 60 watt lamps and electronic ballasts.

Implementation of this project will save approximately 5184 MBtu of electricity each year which currently costs $105,000. The SIR is 3.6 and the payback is 4.3 years.

List of Occupants

N/A

Space and Requirements

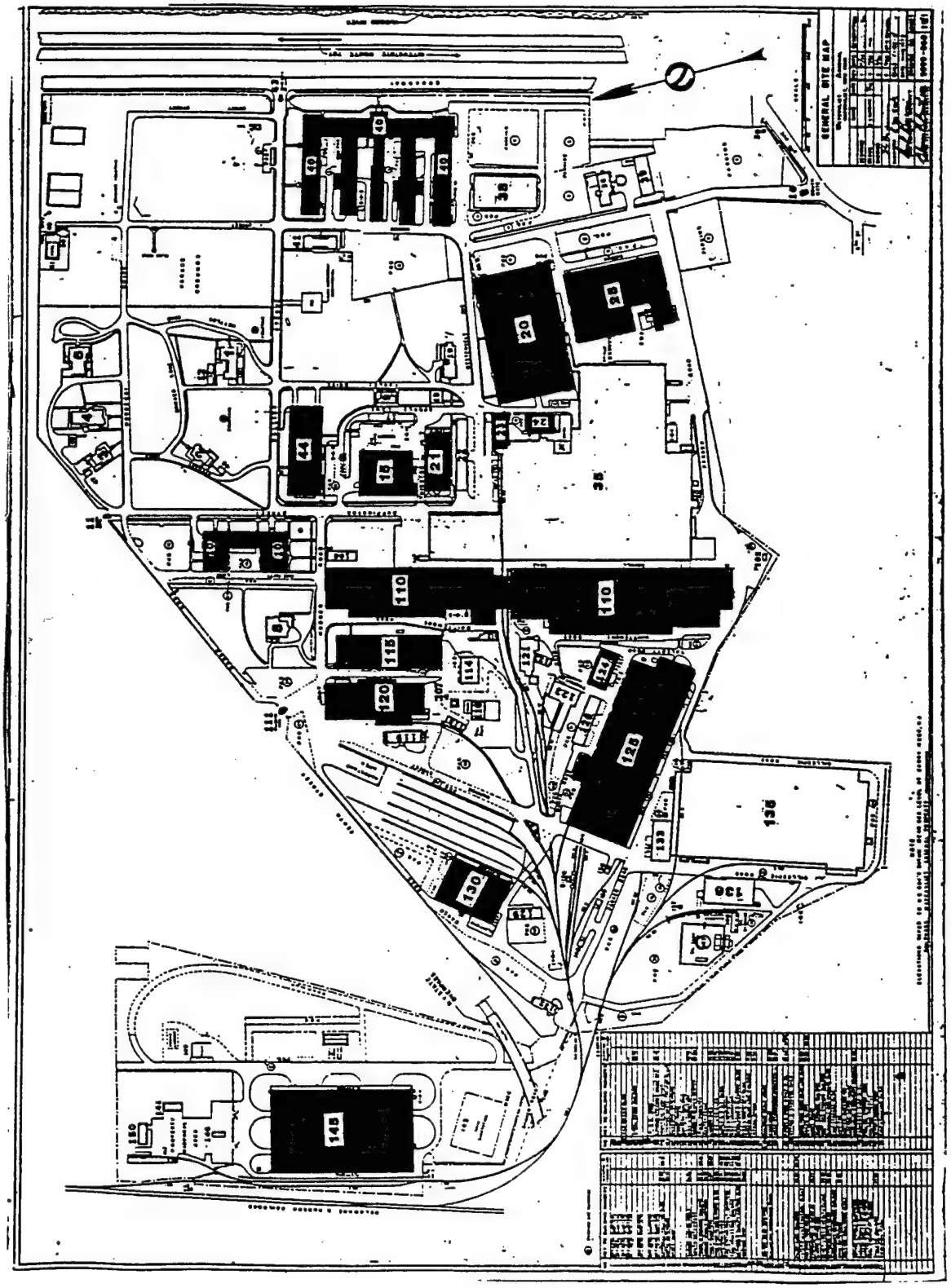
N/A

Summary of Future Changes and Impacts

N/A

functional requirements summary, PDB-1

DA FORM 5020-2-R, Feb 82



SITE OF CONSTRUCTION
Buildings affected are darkened.

facilities requirements sketch, PDB- ½

DA FORM 5022-R, Feb 82

ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED – Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED – Significant information summarized or explained and attached.

DOCUMENT ATTACHED – Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-R, Feb 82

A. SPECIAL CONSIDERATIONS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	R			X
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NR			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse ccoordination, etc.)	NR			
A-4	Assignment of airspace	NR			
A-5	Economic analysis of alternatives	R			X
A-6	Approval for new starts	NR			
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	NR			
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	NR			
A-9	Exceptions to established criteria	NR			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	NR			
A-11	Identification of related or support projects (so projects can be coordinated)	NR			
A-12	Required completion date	NR			
	Other Special Considerations (List and number items)				

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documentation checklist

DA FORM 5023-A-R, Feb 82

B. SITE DEVELOPMENT

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
B-1	Consultation with the District Office to determine and evaluate flood plain hazards	NR			
B-2	Preparation, submission, and/or approval of new	NR			
(A)	General Site Plan	NR			
(B)	Annotated General Site Plan	NR			
(C)	Sketch Site Plan	NR			
(D)	Facilities Requirements Sketch				
B-3	Preparation of				
(A)	Site Survey	NR			
(B)	Subsoil information	NR			
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NR			
	Other Site Development Considerations (List and number items)				

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documentation checklist

DA FORM 5023-B-R, Feb 82

C. ARCHITECTURAL & STRUCTURAL

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
C-1	Reconciliation with troop housing programs and requirements	NR			
C-2	Evaluation of existing facilities (including degree of utilization)	NR			
C-3	Approval for removal and relocation of existing useable facilities	NR			
C-4	Evaluation of off-post community facilities	NR			
C-5	Storage and maintenance facilities (including nuclear weapons)	NR			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	R	B		
C-7	Coordination of aviation facilities with FAA	NR			
C-8	Coordination air traffic control and navigational aids with USACC	NR			
C-9	Tabulation of types and numbers of aircraft	NR			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NR			
C-11	Coordination chapels with Chief of Chaplains	NR			
C-12	Review food service facilities by USATSA	NR			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NR			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	R			X
C-19	Consideration of alternatives	R			X
C-20	Determination whether occupants will include physically handicapped or disabled persons	NR			
C-21	As-build drawings for alterations or additions	NR			
C-22	Availability of Standard Design or site adaptable designs	NR			
	Other Architectural & Structural (List and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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documentation checklist

DA FORM 5023-C-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-1	Fuel considerations and cost comparison analysis	R			X
D-2	Energy requirements appraisal (ERA)	R		X	
D-3	Conformance with DOD Energy Reduction requirements	R		X	
D-4	Evaluation of existing and/or proposed utility systems	NR			
	Other Mechanical and Utility Systems (List and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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E – Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	Environmental impact assessment	NR			
E-2	EIA conclusions require Environmental Impact Statement	NR			
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)	NR			
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	NR			
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	NR			
	Other environmental considerations (list and number items)				

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E – Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-E-R, Feb 82

COMMENTS

DOCUMENTATION CHECK LIST

ITEM	COMMENT
D-2	The ERA is part of the 1391 package.
D-3	This project will reduce energy consumption at Watervliet Arsenal

ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-R, Feb 82

A. SPECIAL CONSIDERATIONS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NR			
A-2	Construction phasing requirements		A,B		
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	NR			
A-4	Equipment in place and justification	NR			
A-5	Other equipment and furniture (O&MA, OPA) and costs	NR			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	NR			
A-7	Type of construction (permanent, temporary, semi-permanent)	NR			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NR			
	Other special considerations (list and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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DOCUMENT ATTACHED – Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-A-R, Feb 82

B. SITE DEVELOPMENT

	ITEM	Required or Not Required	To Be Determined	Comment Attached	Document Attached
B-1	Construction restrictions or guidelines pertaining to				
(A)	site access and preferred construction routes	NR			
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	NR			
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)	NR			
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NR			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/ chemical contamination/asbestos emissions/toxic gases	NR			
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			
B-5	Landscape considerations				
(A)	Protection of existing vegetation	NR			
(B)	Stockpile topsoil	NR			
	Other Site Development (List and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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*BY WHOM (Check and insert appropriate letter)

A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-B-R, Feb 82

C. ARCHITECTURAL & STRUCTURAL

	ITEM	Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Vibration-producing equipment requiring isolation	NR			
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	NR			
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)	NR			
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	NR			
C-5	Designation and strength of units to be accommodated	NR			
C-6	Requirements and data for special design projects	NR			
C-7	Unusual floor and roof loads (safes, equipment)	NR			
C-8	Security features (arms rooms, vaults, interior secure areas)	NR			
	Other Architectural & Structural (List and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED – Information needed but not currently available. Enter code for information source.

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A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-C-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	NR			
D-2	Special peak usage periods and peak leveling techniques	NR			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	NR			
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	NR			
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	NR			
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	NR			
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	NR			
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	NR			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	NR			
D-10	Solar energy evaluation	NR			
	Other Mechanical & Utility Systems (List and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED – Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED – Significant information summarized or explained and attached.

DOCUMENT ATTACHED – Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	Waste water treatment, air quality, and solid waste disposal criteria	R		X	
	Other Environmental Considerations (List and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED – Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED – Significant information summarized or explained and attached.

DOCUMENT ATTACHED – Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-E-R, Feb 82

F. FIRE PROTECTION

ITEM		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
F-1	Special fire protection systems or features (detection and suppression equipment, hazards, etc.)	NR			
	Other Fire Protection Considerations (List and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED – Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED – Significant information summarized or explained and attached.

DOCUMENT ATTACHED – Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

technical data checklist

DA FORM 5024-F-R, Feb 82

COMMENTS

TECHNICAL DATA CHECK LIST

ITEM	COMMENT
E-1	Standard ballasts to be removed may contain PCBs, especially if manufactured before 1978. To meet federal hazardous waste disposal requirements PCB-containing ballasts must be sealed in EPA-approved drums and either sent to approved storage sites or incinerated. Watervliet Arsenal currently has a program for proper disposal of these ballasts.

RS&H

SUBJECT ECIP # 1
LAMPS / BALLASTS
DESIGNER C. Warren
CHECKER

AEP NO 290-0379-002
SHEET 1 OF 1
DATE 4/1/92
DATE

SAVINGS CALCULATIONS

FROM ECO PROJECTS

ECO #	ANNUAL ELECT SAVINGS (MBtu/yr)	DIFFERENTIAL LAMP REPL COSTS ($/yr)	REBATE AMT. ($)
8C	117	96	2203
8D	589	809	3138
8H	4478	2530	64979
TOTAL	5,184	3,435	70,320

04/01/92

ECO Construction Cost Estimate
Calculations

ECO Name: Energy Efficient Fluorescent Lights & Ballasts

ECO #: ECIP 1

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$151,780
Labor	$114,206
Subtotal bare costs	$265,986
FICA Insurance (20% of Labor)	$22,841
Sales Tax (not applicable for GOGO)	$0
Subtotal	$288,827
Overhead (15%)	$43,324
Subtotal	$332,151
Profit (10%)	$33,215
Subtotal	$365,366
Bond (1%)	$3,654
Subtotal	$369,020
Contingency (10%)	$36,902
Subtotal (Construction Cost Input For LCCID *)	$405,922
SIOH (6% of Construction Cost)	$24,355
Subtotal	$430,277
Design (6% of Construction Cost)	$24,355
Total Project Cost	$454,632

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE	DATE PREPARED	SHEET 1 OF 1

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: WVA

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE: ☐ CODE A (No design completed) ☒ CODE B (Preliminary design) ☐ CODE C (Final design) ☐ OTHER (Specify)

DRAWING NO.

ESTIMATOR: C. WARREN

CHECKED BY: P. HUTCHINS

ECIP 1 SUMMARY

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
ECO 8C – PROD. AREAS							
32 W LAMPS (T-8)	308	EA	2.25	693	2.10	647	1340
ELECTRONIC BALLASTS	102	EA	21.00	2,142	29.33	2992	5134
ECO 8D - NON-PROD.							
34 W LAMPS	7845	EA	2.25	17,651	1.80	14,121	31772
ECO 8H - PROD AREAS							
60 W LAMPS	6248	EA	2.50	15,620	3.95	24,680	40,300
ELECTRONIC BLSTS	3124	EA	25.00	78,100	35.00	109,340	187,440
				114,206		151,780	265,986

CALCULATIONS FOR ECIP

FICA (20%)

ENG FORM 1 AUG 59 150 (ER 1110-345-730) PREVIOUS EDITION MAY BE USED * U.S. GOVERNMENT PRINTING OFFICE : 1959 O—516148 (TRANSLUCENT)

ECIP 1 - HIGH EFFICIENCY LIGHTING

ECIP COST ESTIMATE CALCULATIONS

	#	LABOR	MATERIAL	
32W T8 LAMPS	308	$693	$647	
FICA (20% LAB)		$139		
SUBTOTAL		$832	$647	
OVERHEAD (15%)		$125	$97	
SUBTOTAL		$956	$744	
PROFIT (10%)		$96	$74	
SUBTOTAL		$1,052	$818	
BOND (1%)		$11	$8	
SUBTOTAL		$1,062	$827	
PER UNIT		$3.45	$2.68	$6.13

	#	LABOR	MATERIAL	
32W T8 BALLASTS	102	$2,142	$2,992	
FICA (20% LAB)		$428		
SUBTOTAL		$2,570	$2,992	
OVERHEAD (15%)		$386	$449	
SUBTOTAL		$2,956	$3,441	
PROFIT (10%)		$296	$344	
SUBTOTAL		$3,252	$3,785	
BOND (1%)		$33	$38	
SUBTOTAL		$3,284	$3,823	
PER UNIT		$32.20	$37.48	$69.67

	#	LABOR	MATERIAL	
34W LAMPS	7845	$17,651	$14,121	
FICA (20% LAB)		$3,530		
SUBTOTAL		$21,181	$14,121	
OVERHEAD (15%)		$3,177	$2,118	
SUBTOTAL		$24,358	$16,239	
PROFIT (10%)		$2,436	$1,624	
SUBTOTAL		$26,794	$17,863	
BOND (1%)		$268	$179	
SUBTOTAL		$27,062	$18,042	
PER UNIT		$3.45	$2.30	$5.75

	#	LABOR	MATERIAL	
60W LAMPS	6248	$15,620	$24,680	
FICA (20% LAB)		$3,124		
SUBTOTAL		$18,744	$24,680	
OVERHEAD (15%)		$2,812	$3,702	
SUBTOTAL		$21,556	$28,382	
PROFIT (10%)		$2,156	$2,838	
SUBTOTAL		$23,711	$31,220	
BOND (1%)		$237	$312	
SUBTOTAL		$23,948	$31,532	
PER UNIT		$3.83	$5.05	$8.88

	#	LABOR	MATERIAL	
60W LAMP BALLASTS	3124	$78,100	$109,340	
FICA (20% LAB)		$15,620		
SUBTOTAL		$93,720	$109,340	
OVERHEAD (15%)		$14,058	$16,401	
SUBTOTAL		$107,778	$125,741	
PROFIT (10%)		$10,778	$12,574	
SUBTOTAL		$118,556	$138,315	
BOND (1%)		$1,186	$1,383	
SUBTOTAL		$119,741	$139,698	
PER UNIT		$38.33	$44.72	$83.05

FORM 1391 - COST ESTIMATE

32W LAMPS	308	$6.13	2	1,889	1,889	308	2.25	693	2.10	647
ELECT. BALL	102	$69.67	7	7,107	7,107	102	21.00	2,142	29.33	2,992
34W LAMPS	7845	$5.75	45	55,481	45,104	7845	2.25	17,651	1.80	14,121
60W LAMPS	6248	$8.88	56	45,104	55,481	6248	2.50	15,620	3.95	24,680
EL BALL	3124	$83.05	259	259,440	259,440	3124	25.00	78,100	35.00	109,340
SUB			369		369,020			114,206		151,779
CONT (10%)			37		36,902					
TOT CONTRACT			406		405,922					
SIOH (6%)			24		24,355					
TOTAL REQUEST			430		430,277					

RS&H®

SUBJECT ENERGY-EFFICIENT FLUORESCENT LAMPS/BALLASTS
DESIGNER C. WARREN
CHECKER

AEP NO 290-0379-002
SHEET 1 OF
DATE 3/26/92
DATE

ECO 8 —

REPLACEMENT OF STANDARD FLUORESCENT LAMPS AND/OR BALLASTS WITH ENERGY-EFFICIENT TYPES

1/ SURVEY OF BUILDINGS ON WVA TABULATED IN TABLES 8-1 and 8-2, SHOWING TYPES OF FLUORESCENT LAMPS, NUMBERS OF LAMPS AND FIXTURES; WATTS AND KWH/YR, respectively.

ASSUMPTIONS - PRODUCTION AREAS ENERGIZE LIGHTS
24 HRS/DAY X 5 DAYS/WK X 50 WKS/YR

= 6000 HRS/YR

NON-PRODUCTION AREAS

11 HRS/DAY X 5 DAYS/WK X 50 WKS/YR

= 2,750 HRS/YR

STANDARD FIXTURE POWER DRAWS TAKEN FROM LIGHTING TEXTS — SURVEY NOTES CONTAIN DATA FOR EACH BUILDING THAT IS SUMMARIZED IN TABLES 8-1, 8-2.

2/ PREDOMINANT TYPES

F40T12 = 1,134,612/6,140,625 KWH/YR = 18.5%

F96T12 = 3,528,527/6,140,625 KWH/YR = 57.5%

F90T12 = 1,156,800/6140.625 KWH/YR = 18.8%

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SUBJECT ENERGY LAMPS/BALLASTS
AEP NO 290-0379-002
SHEET 2 OF
DESIGNER C. WARREN
DATE 3/26/92
CHECKER
DATE

CONSIDER F40T12 & F96T12 FOR REPLACEMENT - F90T12 IS REPLACEMENT FOR F90T17 AND IS ENERGY-EFFICIENT.

REPLACEMENTS FOR F40T12 LAMPS

① 34 W
② 32 W T-8 SYSTEM - REQUIRES ELECTRONIC BALLAST

BALLASTS FOR F40

① ENERGY ELECTROMAGNETIC
② ELECTRONIC

REPLACEMENTS FOR F96T12 LAMPS

① 60 W

BALLASTS - ELECTRONIC

SPECIFICATIONS AND PRICES TABLES 8-3 AND 8-4, resp.

3/ PERFORM CALCULATIONS TO DETERMINE INPUT DATA FOR LCCID CALCULATIONS

CASES CONSIDERED -

8A. REPLACE 40-W LAMPS IN PRODUCTION AREAS WITH 34W LAMPS
LAMPS 308 (TABLE 8-1) 300 IN 100 FIXTURES
8 IN 4 FIXTURES
EXISTING 3-TUBE FIXTURES DRAW 144 W/FIXTURE
" 2-TUBE FIXTURES DRAW 96 W/FIXTURE
REPLACING W/ 34 WATT TUBES 15.9% DROP IN LUMENS
144 W/FIX ⇒ 120 W/FIX
96 W/FIX ⇒ 80 W/FIX

RS&H

SUBJECT ENERGY LAMPS/BALLASTS AEP NO 290-0379-002
SHEET 3 OF
DESIGNER C. WARREN DATE 3/26/92
CHECKER DATE

8B. SAME AS A; REPLACE BALLASTS WITH ENERGY-EFFICIENT ELECTROMAGNETIC BALLASTS
1 BALLAST / 2 LAMPS (WVA ELECT. DEPT.)
152 BALLASTS

3-TUBE FIXTURES FROM 144 W/FIX ⇒ 95 W/FIX
2-TUBE FIXTURES FROM 96 W/FIX ⇒ 66 W/FIX

8C. REPLACE 40 W LAMPS & BALLASTS WITH F40T8 LAMPS (32 W) and ELECTRONIC BALLASTS ⇒ 7.9% DROP IN LUMENS FROM EXISTIN
3 TUBE FIXTURES USE 1 BALLAST/FIXTURE
DRAW 88 W/FIXTURE
2 TUBE FIXTURES / 1 BALLAST
DRAW 58 W/FIXTURE

8D. SAME AS A; MIXTURE OF 2, 3, 4 TUBE FIXTURES
ALL USE 1 BALLAST / 2 TUBES - NON PRODUCTION BLDGS

8E. SAME AS B, NON-PRODUCTION BLDGS

8F. SAME AS C, except 1 BALLAST/2 LAMPS;
NON-PRODUCTION BLDGS

8G. REPLACE 75 W F96T12 LAMPS WITH 60 W F96T12 LAMPS
PRODUCTION BUILDINGS ⇒ 10.6% DROP IN LUMENS
175 W/FIXTURE ⇒ 163 W/FIXTURE

8H. SAME AS G, WITH BALLAST REPLACEMENT (ELECTRONIC)
1 BALLAST / 2 LAMPS
175 W/FIXTURE ⇒ 105 W/FIXTURE
(MAJORITY OF LAMPS IN BLDG 25 WITH 3.9 W/SF - LOSS OF LUMENS SHOULD NOT AFFECT WORK)

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SUBJECT ENERGY LAMPS/BALLASTS AEP NO 290-0379-002
SHEET 4 OF
DESIGNER C. WARREN DATE 3/26/92
CHECKER DATE

8I. SAME AS 6; NON-PRODUCTION BLDGS

8J. SAME AS 7; NON-PRODUCTION BLDGS

LABOR AND MATERIAL COSTS / CONSTRUCTION COSTS
SHOWN ON FOLLOWING COST ESTIMATE SHEETS

REPLACEMENT COSTS

ASSUMPTIONS - 20,000 HRS LIFETIME FOR ALL LAMPS
NO BALLAST REPLACEMENTS
25 YR PROJECT LIFETIME
LABOR COSTS ARE SAME FOR STD VS ENERGY LAMPS

AVG LAMP REPLACEMENTS PER YR

(1) PRODUCTION AREAS F40 LAMPS & F96

$$\frac{20{,}000 \text{ HRS/LAMP}}{6{,}000 \text{ HRS/YR}} = 3.33 \frac{\text{YRS}}{\text{LAMP}}$$

$$\frac{308 \text{ LAMPS}}{3.33 \text{ YRS}} = 92.4 \text{ REPLACEMENTS/YR}$$

(2) NON-PRODUCTION F40/F96

$$\frac{20{,}000}{2750} = 7.27 \text{ YRS/LAMP}$$

$$\frac{7845}{7.27} = 1079 \text{ LAMPS/YR REPLACED}$$

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AEP NO 290-0379-002
SHEET 5 OF
DATE 3/26/92
DATE

(3) PRODUCTION AREAS F96 LAMPS

$\frac{6248 \text{ LAMPS}}{3.33 \text{ YRS}} = 1,876 \text{ REPL/YR}$

(4) NON-PRODUCTION F96

$\frac{1032}{7.27} = 142 \text{ REPL/YR}$

REPLACEMENT LAMP COSTS -

	# REPLACEMENTS/YR	LAMP PRICE (EA)	TOTAL
PRODUCTION AREAS			
F40T12 (STD)	92	1.05	97
F40T12/WM	92	1.80	166
F32T8	92	2.10	193
F96T12 (STD)	1876	2.60	4878
F96T12/WM	1876	3.95	7410
NON-PRODUCTION AREAS			
F40T12 (STD)	1079	1.05	1133
F40T12/WM	1079	1.80	1942
F32T8	1079	2.10	2266
F96T12 (STD)	142	2.60	369
F96T12/WM	142	3.95	560

SUMMARY OF SAVINGS FOR EACH ECO – PROJECT SUMMARY DATA
FOLLOWS ON PAGES 8-10 thru 8-14

FLUORESCENT LIGHTING S
WATERVLIET ARSENAL
DATES: 15 OCT 91 - 18
PROJECT # 290-0379-00

TABLE 8-1 FLUORESCENT LIGHTING INVENTORY

BLDG #	AREA	AVG W/SF	F40T12 # LTS	F40T12 # FXTRS	F96T12 # LTS	F96T12 # FXTRS	F96T12HO # LTS	F96T12HO # FXTRS	F90T12 # LTS	F90T12 # FXTRS	F90T17 # LTS	F90T17 # FXTRS	F72PG17 # LTS	F72PG17 # FXTRS	F96PG17 # LTS	F96PG17 # FXTRS	TOTAL LTS	TOTAL FXTRS
																	1,728	864
20	MANUF	1.9							1,728	864							5,600	2,800
25	MANUF	3.9			5,600	2,800											0	0
35	MANUF	N/A															1,148	524
110	MANUF	1.3	300	100	648	324			200	100							192	96
125	MANUF	1.5	8	4			184	92									0	0
135	MANUF	N/A																
	TOTAL MANUF		308	104	6,248	3,124	184	92	1,928	964	0	0	0	0	0	0	8,668	4,284
																	1,046	379
10	OFFICES	0.9	1,042	377	4	2											186	93
15	NTR POOL	0.5	182	91	4	2											62	31
15	OFFICES	0.5	62	31													372	124
20	OFFICES	1.8	372	124													124	62
21	CAFETERIA	0.4	124	62													0	0
22	FIRE STA	N/A															302	127
23	MANUF/SPLY	0.9	212	82	90	45											114	57
24	OFFICES	1.2	114	57													1,048	524
40	OFFICES/LABS	1.3	860	430	188	94											1,678	537
44	OFFICES	1.4	1,512	454	166	83											1,471	608
115	OFFICES	1.2	1,451	598	20	10											262	131
120	STORAGE	0.6	104	52	158	79					252	126					252	126
120	SHOPS	1.1															362	181
120	OFFICES	1.2	352	176	10	5							60	30			1,010	505
120	LABS	1.8	950	475											24	12	66	33
123	CLEANING	1.3					42	21									360	180
124	OFFICES/LABS	1.2	360	180							18	9					252	126
130	WAREHOUSE	0.7	72	36	162	81					12	6					318	159
145	WAREHOUSE	0.2	76	38	230	115												
	TOTAL OTHER		7,845	3,263	1,032	516	42	21	0	0	282	141	60	30	24	12	9,285	3,983
	TOTAL WVA	1.4	8,153	3,367	7,280	3,640	226	113	1,928	964	282	141	60	30	24	12	17,953	8,267

FLUORESCENT LIGHTING SURVEY - SUMMARY
WATERVLIET ARSENAL
DATES: 15 OCT 91 - 18 OCT 91
PROJECT # 290-0379-002

TABLE 8-2 FLUORESCENT LIGHTING CURRENT ENERGY USE

BLDG #	AREA	AVG W/SF	F40T12 WATTS	F40T12 KWH/YR	F96T12 WATTS	F96T12 KWH/YR	F96T12HO WATTS	F96T12HO KWH/YR	F90T12 WATTS	F90T12 KWH/YR	F90T17 WATTS	F90T17 KWH/YR	F72PG17 WATTS	F72PG17 KWH/YR	F96PG17 WATTS	F96PG17 KWH/YR	TOTAL WATTS	TOTAL KWH/YR
20	MANUF	1.9							172,800	1,036,800							172,800	1,036,800
25	MANUF	3.9			490,000	2,940,000											490,000	2,940,000
35	MANUF	N/A															0	0
110	MANUF	1.3	14,400	86,400	56,700	340,200			20,000	120,000							91,100	546,600
125	MANUF	1.5	384	2,304			23,460	140,760									23,844	143,064
135	MANUF	N/A															0	0
	TOTAL MANUF		14,784	88,704	546,700	3,280,200	23,460	140,760	192,800	1,156,800	0	0	0	0	0	0	777,744	4,666,464
10	OFFICES	0.9	50,016	137,544	350	963											50,366	138,507
15	MTR POOL	0.5	8,736	24,024	350	963											9,086	24,987
15	OFFICES	0.5	2,976	8,184													2,976	8,184
20	OFFICES	1.8	17,856	49,104													17,856	49,104
21	CAFETERIA	0.4	5,952	16,368													5,952	16,368
22	FIRE STA	N/A															0	0
23	MANUF/SPLY	0.9	10,176	38,352	7,875	21,656											18,051	60,008
24	OFFICES	1.2	5,472	15,048													5,472	15,048
40	OFFICES/LABS	1.3	41,280	113,520	16,450	45,238											57,730	158,758
44	OFFICES	1.4	72,576	199,584	14,525	39,944											87,101	239,528
115	OFFICES	1.2	69,648	191,532	1,750	4,813											71,398	196,345
120	STORAGE	0.6	4,992	13,728	13,825	38,019											18,817	51,747
120	SHOPS	1.1									27,090	74,498					27,090	74,498
120	OFFICES	1.2	16,896	46,464	875	2,406											17,771	48,870
120	LABS	1.8	45,600	125,400									11,385	31,309			56,985	156,709
123	CLEANING	1.3					5,355	32,130							5,520	33,120	10,875	65,250
124	OFFICES/LABS	1.2	17,280	47,520													17,280	47,520
130	WAREHOUSE	0.7	3,456	9,504	14,175	38,981					1,935	5,321					19,566	53,806
145	WAREHOUSE	0.2	3,648	10,032	20,125	55,344					1,290	3,548					25,063	68,924
	TOTAL OTHER		376,560	1,045,908	90,300	248,327	5,355	32,130	0	0	30,315	83,367	11,385	31,309	5,520	33,120	519,435	1,474,161
	TOTAL WVA	1.5	391,344	1,134,612	637,000	3,528,527	28,815	172,890	192,800	1,156,800	30,315	83,367	11,385	31,309	5,520	33,120	1,297,179	6,140,625

TABLE B-3

FLUORESCENT LAMP SPECIFICATIONS
WVA - #290-0379-002
10-Feb-92

LAMP(1)	BULB DIAM "		WATTS	BASE	LIFE (HRS) 12-HR START	LUMENS	CURRENT (MA)	PRICE ($)
F40CW(GE)	1.5	STD	40	BIPIN	20000	3050	425	
F40CW(P)	1.5	STD	40	BIPIN	20000	3150	425	
F40CW/RS/WM(GE)	1.5	ENERGY	34	BIPIN	20000	2650	425	$1.80
F40CW/RS/EW-II(P)	1.5	ENERGY	34	BIPIN	20000	2775	425	
F40/CW/EW-PH(P)	1.5	ENERGY	34	BIPIN	15000	2850	425	
F40CW/RS/WMP(GE)	1.5	ENERGY	32	BIPIN	15000	2525	425	$2.10
F40T8(GE)	1.0	STD	40	BIPIN	20000	3600	265	
F40T8(P)	1.0	STD	40	BIPIN	20000	3650	265	
F32T8(P)	1.0	ENERGY	32	BIPIN	20000	2900	265	$2.10
F040T8(S)	1.0	STD	40	BIPIN	20000	3650	265	
F032T8(S)	1.0	ENERGY	32	BIPIN	20000	2900	265	
F72PG17(GE)	2.125	STD	165	RDC	15000	11000	1500	
F96T12/CW(GE)	1.5	STD	75	SINGLE	18000	6150	425	
F96T12/CW(P)	1.5	STD	75	SINGLE	12000	6300	425	
F96T12/CW/WM(GE)	1.5	ENERGY	60	SINGLE	18000	5500	425	$3.95
F96T12/CW/EW(P)	1.5	ENERGY	60	SINGLE	12000	5600	425	
F96T12/CW/HO(GE)	1.5	STD	105	RDC	18000	8900	800	
F96T12/CW/HO(P)	1.5	STD	105	RDC	12000	9200	800	
F96T12/CW/HO/WM(GE)	1.5	ENERGY	95	RDC	18000	8000	800	$5.30
F96T12/CW/HO/EW(P)	1.5	ENERGY	95	RDC	12000	8300	800	
F96PG17/CW(GE)	2.125	STD	215	RDC	15000	15300	1500	
F96PG17/CW/WM(GE)	2.125	ENERGY	185	RDC	15000	13500	1500	$11.45
F90T17/CW(GE)	2.125	STD	90	MOG BIP	15000	6000	425	
F90T17/CW/WM(GE)	2.125	ENERGY	82	MOG BIP	15000	5750	425	$9.00
F90T12/CW/60/EW(P) (REPLACES F90T17/CW)	1.5	ENERGY	84	MOG BIP	9000	6250	425	$9.00

(1) GENERAL ELECTRIC (GE)
PHILIPS (P)
SYLVANIA (S)

SOURCES: SPECIFICATIONS FROM MANUF. CATALOGS
PRICE QUOTES FROM VENDORS

TABLE 8-4

FLUORESCENT BALLAST SPECIFICATIONS
WVA - #290-0379-002
12-Feb-92

LAMPS	WATTS	BALLASTS	BALLAST INPUT (W)	PRICE ($)
F40T12/RS	40	ADV MARK IV	80	$20.00
STD		EBT ELECTRONIC	71	
		GE OPTIMISER	71	
		GE PERFORMANCE SS	70	
		STANDARD	96	
F40T12/RS	34	ADV MARK IV	66	$20.00
ENERGY		EBT ELECTRONIC	59	$25.20
		GE OPTIMISER	59	
F40T12/RS	32	GE MAXI-MISER II	72	
ENERGY				
F40T8/IS	40	EBT ELECTRONIC	70	
STD				
F32T8/IS	32	EBT ELECTRONIC	58	$26.90
ENERGY		T8 MAGNETIC	66	
F96T12/IS	75	GE MAXI-MISER II	158	
STD		EBT ELECTRONIC	130	
		STANDARD	175	
F96T12/IS	60	GE MAXI-MISER II	136	
ENERGY		EBT ELECTRONIC	105	$35.00
F96T12/HO	105	GE WATT-MISER	237	
STD		GE MAXI-MISER II	254	
		STANDARD	255	
		EBT ELECTRONIC	190	
F96T12/HO	95	GE MAXI-MISER II	212	
ENERGY		EBT ELECTRONIC	160	$44.00
F96PG17				
STD	215	STANDARD	460	
ENERGY	185	STANDARD	400	
F90T17				
STD	90	STANDARD	215	
ENERGY	82	STANDARD	200	
F90T12	84	STANDARD	200	

SOURCES: SPECIFICATIONS FROM MANUF. CATALOGS

PRICES FROM VENDORS

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8A
Replace 40-Watt Fluorescents with 34-Watt Lamps
Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T12/WM Std. Bal.	Savings
Number Lamps	308.0	308.0	0.0
Number Fixtures	104.0	104.0	0.0
Number Ballasts	152.0	152.0	0.0
Load, kW	14.8	12.4	2.5
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	303.7	253.1	50.6
Lamp Repl Cost, $/yr	97.0	166.0	-69.0
Rebate Amt., $	0.0	-123.2	123.2

8B
Replace 40-Watt Fluorescents with 34-Watt Lamps
Replace Standard Ballasts with Energy - Efficient Electromagnetic Ballasts
Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T12/WM EM Bal.	Savings
Number Lamps	308.0	308.0	0.0
Number Fixtures	104.0	104.0	0.0
Number Ballasts	152.0	152.0	0.0
Load, kW	14.8	9.8	5.0
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	302.7	200.4	102.4
Lamp Repl Cost, $/yr	97.0	166.0	-69.0
Rebate Amt., $	0.0	-3163.2	3163.2

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8C
Replace 40-Watt Lamps and Ballasts with T8 System
Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T8 Elect. Bal.	Savings
Number Lamps	308.0	308.0	0.0
Number Fixtures	104.0	104.0	0.0
Number Ballasts	152.0	102.0	50.0
Load, kW	14.8	9.1	5.7
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	302.7	185.6	117.1
Lamp Repl Cost, $/yr	97.0	193.0	-96.0
Rebate Amt., $	0.0	-2203.2	2203.2

8D
Replace 40-Watt Fluorescents with 34-Watt Lamps
Non-Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T12/WM Std. Bal.	Savings
Number Lamps	7845.0	7845.0	0.0
Number Fixtures	3263.0	3263.0	0.0
Number Ballasts	3923.0	3923.0	0.0
Load, kW	376.6	313.8	62.7
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	3534.3	2945.6	588.7
Lamp Repl Cost, $/yr	1133.0	1942.0	-809.0
Rebate Amt., $	0.0	-3138.0	3138.0

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8E
Replace 40-Watt Fluorescents with 34-Watt Lamps
Replace Standard Ballasts with Energy - Efficient Electromagnetic Ballasts
Non-Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T12/WM EM Bal.	Savings
Number Lamps	7845.0	7845.0	0.0
Number Fixtures	3263.0	3263.0	0.0
Number Ballasts	3923.0	3923.0	0.0
Load, kW	376.6	258.9	117.6
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	3534.3	2430.1	1104.2
Lamp Repl Cost, $/yr	1133.0	1942.0	-809.0
Rebate Amt., $	0.0	-81598.0	81598.0

8F
Replace 40-Watt Lamps and Ballasts with T8 System
Non-Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T8 Elect. Bal.	Savings
Number Lamps	7845.0	7845.0	0.0
Number Fixtures	3263.0	3263.0	0.0
Number Ballasts	3923.0	3923.0	0.0
Load, kW	376.6	227.5	149.0
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	3534.3	2135.6	1398.7
Lamp Repl Cost, $/yr	1133.0	2266.0	-1133.0
Rebate Amt., $	0.0	-81598.0	81598.0

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8G
Replace 75-Watt Fluorescents with 60-Watt Lamps
Production Areas

	Existing F96T12 Std. Bal.	Proposed F96T12/WM Std. Bal.	Savings
Number Lamps	6248.0	6248.0	0.0
Number Fixtures	3124.0	3124.0	0.0
Number Ballasts	3124.0	3124.0	0.0
Load, kW	546.7	509.2	37.5
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	11195.3	10427.4	767.9
Lamp Repl Cost, $/yr	4878.0	7410.0	-2532.0
Rebate Amt., $	0.0	-2499.2	2499.2

8H
Replace 75-Watt Fluorescents with 60-Watt Lamps
Replace Standard Ballasts with Energy - Efficient Electronic Ballasts
Production Areas

	Existing F96T12 Std. Bal.	Proposed F96T12/WM Elect. Bal.	Savings
Number Lamps	6248.0	6248.0	0.0
Number Fixtures	3124.0	3124.0	0.0
Number Ballasts	3124.0	3124.0	0.0
Load, kW	546.7	328.0	218.7
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	11195.3	6717.2	4478.1
Lamp Repl Cost, $/yr	4878.0	7410.0	-2532.0
Rebate Amt., $	0.0	-64979.2	64979.2

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8I
Replace 75-Watt Fluorescents with 60-Watt Lamps
Non-Production Areas

	Existing F96T12 Std. Bal.	Proposed F96T12/WM Std. Bal.	Savings
Number Lamps	1032.0	1032.0	0.0
Number Fixtures	516.0	516.0	0.0
Number Ballasts	516.0	516.0	0.0
Load, kW	90.3	84.1	6.2
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	847.5	789.3	58.2
Lamp Repl Cost, $/yr	369.0	560.0	-191.0
Rebate Amt., $	0.0	-412.8	412.8

8J
Replace 75-Watt Fluorescents with 60-Watt Lamps
Replace Standard Ballasts with Energy - Efficient Electronic Ballasts
Non-Production Areas

	Existing F96T12 Std. Bal.	Proposed F96T12/WM Elect. Bal.	Savings
Number Lamps	1032.0	1032.0	0.0
Number Fixtures	516.0	516.0	0.0
Number Ballasts	516.0	516.0	0.0
Load, kW	90.3	54.2	36.1
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	847.5	508.5	339.0
Lamp Repl Cost, $/yr	369.0	560.0	-191.0
Rebate Amt., $	0.0	-10732.8	10732.8

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 34-Watt Lamps
Production Areas

ECO #: 8A

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$554
Labor	$693
Subtotal bare costs	$1,247
FICA Insurance (20% of Labor)	$139
Sales Tax (not applicable for GOGO)	$0
Subtotal	$1,386
Overhead (15%)	$208
Subtotal	$1,594
Profit (10%)	$159
Subtotal	$1,753
Bond (1%)	$18
Subtotal	$1,771
Contingency (10%)	$177
Subtotal (Construction Cost Input For LCCID *)	$1,948
SIOH (6% of Construction Cost)	$117
Subtotal	$2,065
Design (6% of Construction Cost)	$117
Total Project Cost	$2,182

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 34-Watt Lamps
Replace Standard Ballasts With Energy EM Ballasts
Production Areas

ECO #: 8B

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$3,594
Labor	$3,885
Subtotal bare costs	$7,479
FICA Insurance (20% of Labor)	$777
Sales Tax (not applicable for GOGO)	$0
Subtotal	$8,256
Overhead (15%)	$1,238
Subtotal	$9,494
Profit (10%)	$949
Subtotal	$10,443
Bond (1%)	$104
Subtotal	$10,547
Contingency (10%)	$1,055
Subtotal (Construction Cost Input For LCCID *)	$11,602
SIOH (6% of Construction Cost)	$696
Subtotal	$12,298
Design (6% of Construction Cost)	$696
Total Project Cost	$12,994

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 32-Watt Lamps
Replace Standard Ballasts With Electronic Ballasts
Production Areas

ECO #: 8C

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$3,639
Labor	$2,835
Subtotal bare costs	$6,474
FICA Insurance (20% of Labor)	$567
Sales Tax (not applicable for GOGO)	$0
Subtotal	$7,041
Overhead (15%)	$1,056
Subtotal	$8,097
Profit (10%)	$810
Subtotal	$8,907
Bond (1%)	$89
Subtotal	$8,996
Contingency (10%)	$900
Subtotal (Construction Cost Input For LCCID *)	$9,896
SIOH (6% of Construction Cost)	$594
Subtotal	$10,490
Design (6% of Construction Cost)	$594
Total Project Cost	$11,084

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 34-Watt Lamps
Non-Production Areas

ECO #: 8D

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$14,121
Labor	$17,651
Subtotal bare costs	$31,772
FICA Insurance (20% of Labor)	$3,530
Sales Tax (not applicable for GOGO)	$0
Subtotal	$35,302
Overhead (15%)	$5,295
Subtotal	$40,597
Profit (10%)	$4,060
Subtotal	$44,657
Bond (1%)	$447
Subtotal	$45,104
Contingency (10%)	$4,510
Subtotal (Construction Cost Input For LCCID *)	$49,614
SIOH (6% of Construction Cost)	$2,977
Subtotal	$52,591
Design (6% of Construction Cost)	$2,977
Total Project Cost	$55,568

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 34-Watt Lamps
Replace Standard Ballasts With Energy EM Ballasts
Non-Production Areas

ECO #: 8E

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$92,581
Labor	$100,034
Subtotal bare costs	$192,615
FICA Insurance (20% of Labor)	$20,007
Sales Tax (not applicable for GOGO)	$0
Subtotal	$212,622
Overhead (15%)	$31,893
Subtotal	$244,515
Profit (10%)	$24,452
Subtotal	$268,967
Bond (1%)	$2,690
Subtotal	$271,657
Contingency (10%)	$27,166
Subtotal (Construction Cost Input For LCCID *)	$298,823
SIOH (6% of Construction Cost)	$17,929
Subtotal	$316,752
Design (6% of Construction Cost)	$17,929
Total Project Cost	$334,681

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 32-Watt Lamps
Replace Standard Ballasts With Electronic Ballasts
Non-Production Areas

ECO #: 8F

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$122,395
Labor	$100,034
Subtotal bare costs	$222,429
FICA Insurance (20% of Labor)	$20,007
Sales Tax (not applicable for GOGO)	$0
Subtotal	$242,436
Overhead (15%)	$36,365
Subtotal	$278,801
Profit (10%)	$27,880
Subtotal	$306,681
Bond (1%)	$3,067
Subtotal	$309,748
Contingency (10%)	$30,975
Subtotal (Construction Cost Input For LCCID *)	$340,723
SIOH (6% of Construction Cost)	$20,443
Subtotal	$361,166
Design (6% of Construction Cost)	$20,443
Total Project Cost	$381,609

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/23/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 75-Watt Fluorescents With 60-Watt Lamps
Production Areas

ECO #: 8G

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$24,680
Labor	$15,620
Subtotal bare costs	$40,300
FICA Insurance (20% of Labor)	$3,124
Sales Tax (not applicable for GOGO)	$0
Subtotal	$43,424
Overhead (15%)	$6,514
Subtotal	$49,938
Profit (10%)	$4,994
Subtotal	$54,932
Bond (1%)	$549
Subtotal	$55,481
Contingency (10%)	$5,548
Subtotal (Construction Cost Input For LCCID *)	$61,029
SIOH (6% of Construction Cost)	$3,662
Subtotal	$64,691
Design (6% of Construction Cost)	$3,662
Total Project Cost	$68,353

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/23/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 75-Watt Fluorescents With 60-Watt Lamps
Replace Standard Ballasts With Electronic Ballasts
Production Areas

ECO #: 8H

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$134,020
Labor	$93,720
Subtotal bare costs	$227,740
FICA Insurance (20% of Labor)	$18,744
Sales Tax (not applicable for GOGO)	$0
Subtotal	$246,484
Overhead (15%)	$36,973
Subtotal	$283,457
Profit (10%)	$28,346
Subtotal	$311,803
Bond (1%)	$3,118
Subtotal	$314,921
Contingency (10%)	$31,492
Subtotal (Construction Cost Input For LCCID *)	$346,413
SIOH (6% of Construction Cost)	$20,785
Subtotal	$367,198
Design (6% of Construction Cost)	$20,785
Total Project Cost	$387,983

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/23/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 75-Watt Fluorescents With 60-Watt Lamps
Non-Production Areas

ECO #: 8I

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$4,076
Labor	$2,580
Subtotal bare costs	$6,656
FICA Insurance (20% of Labor)	$516
Sales Tax (not applicable for GOGO)	$0
Subtotal	$7,172
Overhead (15%)	$1,076
Subtotal	$8,248
Profit (10%)	$825
Subtotal	$9,073
Bond (1%)	$91
Subtotal	$9,164
Contingency (10%)	$916
Subtotal (Construction Cost Input For LCCID *)	$10,080
SIOH (6% of Construction Cost)	$605
Subtotal	$10,685
Design (6% of Construction Cost)	$605
Total Project Cost	$11,290

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/23/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 75-Watt Fluorescents With 60-Watt Lamps
Replace Standard Ballasts With Electronic Ballasts
Non-Production Areas

ECO #: 8J

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$22,136
Labor	$15,480
Subtotal bare costs	$37,616
FICA Insurance (20% of Labor)	$3,096
Sales Tax (not applicable for GOGO)	$0
Subtotal	$40,712
Overhead (15%)	$6,107
Subtotal	$46,819
Profit (10%)	$4,682
Subtotal	$51,501
Bond (1%)	$515
Subtotal	$52,016
Contingency (10%)	$5,202
Subtotal (Construction Cost Input For LCCID *)	$57,218
SIOH (6% of Construction Cost)	$3,433
Subtotal	$60,651
Design (6% of Construction Cost)	$3,433
Total Project Cost	$64,084

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE	DATE PREPARED 2/13/92	SHEET 1 OF 2

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: WVA

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE: ☐ CODE A (No design completed) ☒ CODE B (Preliminary design) ☐ CODE C (Final design) ☐ OTHER (Specify)

DRAWING NO.

ESTIMATOR: C. WARREN

CHECKED BY: P. Hutchins

ECO 8 SUMMARY

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
F40T12 LAMP REPLACEMENTS & BALLAST REPLACEMENTS							
PRODUCTION AREAS							
8A 34 W LAMPS	308	EA	2.25	693	1.80	554	1,247
NO BALLAST REPLACEMENTS							
8B 34 W LAMPS	308	EA	2.25	693	1.80	554	1,247
ENERGY EM BALLASTS	152	EA	21.00	3,192	20.00	3,040	6,232
				3,885		3,594	7,479
8C 32 W LAMPS (T8)	308	EA	2.25	693	2.10	647	1,340
ELECTRONIC BALLASTS	102	EA	21.00	2,142	29.33	2,992	5,134
				2,835		3639	6,474
NON-PRODUCTION AREAS							
8D 34 W LAMPS	7845	EA	2.25	17,651	1.80	14,121	31,772
NO BALLAST REPLACEMENTS							
8E 34 W LAMPS	7845	EA	2.25	17,651	1.80	14,121	31,772
ENERGY EM BALLASTS	3923	EA	21.00	82,383	20.00	78,460	160,843
				100,034		92,581	192,615
8F 32 W LAMPS (T8)	7845	EA	2.25	17,651	2.10	16,474	34,125
ELECTRONIC BALLASTS	3923	EA	21.00	82,383	27.00	105,921	188,304
				100,034		122,395	222,429

ENG FORM 150 1 AUG 59 (ER 1110-345-730) PREVIOUS EDITION MAY BE USED (TRANSLUCENT)

CONSTRUCTION COST ESTIMATE	DATE PREPARED 2/13/92	SHEET 2 OF 2

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: WVA

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE: ☐ CODE A (No design completed) ☐ CODE B (Preliminary design) ☐ CODE C (Final design) ☐ OTHER (Specify)

DRAWING NO.

ESTIMATOR: C. WARREN

CHECKED BY

ECO 8 SUMMARY

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
F96T12 LAMP & BALLAST REPLACEMENTS							
PRODUCTION AREAS							
8G 60 W LAMPS NO BALLAST REPLACE	6248	EA	2.50	15,620	3.95	24,680	40,300
8H 60 W LAMPS	6248	EA	2.50	15,620	3.95	24,680	40,300
ELECTRONIC BALLASTS	3124	EA	25.00	78,100	35.00	109,340	187,440
				93,720		134,020	227,740
NON-PRODUCTION AREAS							
8I 60 W LAMPS NO BALLAST REPLACE	1032	EA	2.50	2,580	3.95	4,076	6,656
8J 60 W LAMPS	1032	EA	2.50	2,580	3.95	4,076	6,656
ELECTRONIC BALLASTS	516	EA	25.00	12,900	35.00	18,060	30,960
				15,480		22,136	37,616

RS&H.

Architecture, Engineering and Planning

Reynolds, Smith and Hills, Inc.
4651 Salisbury Road
Jacksonville, Florida 32256

FACSIMILE TRANSMITTAL LETTER

DATE 2/10/92

(813) 282-1151

From → ELECTRONIC BALLAST TECHNOLOGY - Swanson & Co. Tampa

~~TO:~~ ~~FROM:~~ → DR CARLOS WARREN, PE (904) 279-2275

FAX NO. (213) 534-8214

PTAC NUMBER 599361

PROJECT NUMBER: —

TASK NO: —

SENDERS DEPARTMENT NUMBER 2ASN

WE ARE TRANSMITTING 1 PAGES INCLUDING COVER

IF YOU DO NOT RECEIVE ALL PAGES PLEASE TELEPHONE:

904-296-2000

IF YOU WISH TO TRANSMIT FAX COPY TO US PLEASE TELEPHONE: 904-279-2491

COMMENTS: I NEED PRICE QUOTES FOR BULK PURCHASES OF FOLLOWING BALLASTS

SSB1-120-2/40 LH	25.20 ea.
SSB1-277-2/96 HO LH	44.80 ea.
SSB2-120-2/96 IS LH	35.00 ea.
SSB1-120-2/96 HO LH	44.80 ea.
SSB2-120-2/32 IS LH	26.90 ea.

PLEASE QUOTE ASAP Thanks Carlos

SSB2-120-3/32 IS LH 29.33

From: Jim Reynolds

To: ~~Exeon~~: Carlos Warren
RS&H

Quotes on the following (bulk quantities)

Lamps -

GE	F40CW/RS/WM	1.80 ea
	F40 ~~CW~~ LO/RS/WM Plus	2.10 ea
	F96T12/CW/WM	3.95 ea
	F96T12/CW/HO/WM	5.30 ea
	F96PG17/CW/WM	11.45 ea
	F96T17/CW/WM	9.00 ea

or equivalent Philips, ~~Sylvania~~

Philips	F96T12CW/60/EW	$9.00
	FO32/35	$2.10

Ballasts (2 lamp fixtures)

Advance Powerkut Mark IV — RK-2S40-TP 20.00 ea
VK-2S40-TP 22.00 ea

GE Optimizer M2B-120

Maxi-Miser II — BG102BW, BG148W, BG144W, BG100BW, BG100HO

EBT — ~~SSB2-120-2/96 BO LH~~ SSB1-120-2/40 LH, SSB1-120-2/96 BO LH, SSB1-277-2/96 HO LH, SSB2-120-2/32 T4 LH

WATERVLIET ARSENAL
SELF-SERVICE SUPPLY CENTER
- MASTER LIST OF SUPPLIES -
REPAIR & UTILITY

STOCK NUMBER	NOMENCLATURE	MAT-CAT	UNIT ISSUE	UNIT PRICE
6240000000022	LAMP, INDICATOR, #CM7-7632	T	EA	$ 1.52
6240000726127	LAMP, INDICATOR, G.E. #253X	T	EA	$ 3.34
6240005191152	LAMP, INSIDE FROST, 50 WATT, 250 VOLT, A19 BULB, MEDIUM BASE, G.E. #50A	T	EA	$ 1.16
6240010978687	LAMP, LOW PRESSURE SODIUM, CLEAR, T-12 BULB, BASE BT22D, 90 WATT	T	EA	$ 31.38
6240010978686	LAMP, LOW PRESSURE SODIUM, CLEAR, T-17 BULB, BASE BY22D, 55 WATT	T	EA	$ 21.95
6240008856852	LAMP, MERCURY, 400 WATTS, E-37 BULB, MOGUL BASE, DELUXE WHITE G.E. #H-400DX33-1	T	EA	$ 10.34
624000X000001	LAMP, QUARTZ, 85 WATTS, 13.8 VOLTS	T	EA	$ 12.26
6240009516643	LAMP, REFRIGERATOR, G.E. #15 S11/A02	T	EA	$ .96
6240001863264	LAMP, SHOWCASE, CLEAR, G.E. #40-T10	T	EA	$ 1.13
6240005042507	LAMP, SHOWCASE, G.E. #25T6-1/2IF	T	EA	$ .40
6240009855239	LAMP, 40 WATT BULB, NO. T-10, BASE; 4-PIN, COOL WHITE, RAPID START, 16"DIA., G.E., #FC16T10/CW/RS	T	EA	$ 4.00
6240001520000	LAMP, 40 WATT, 115/125 VOLTS, INSIDE FROST STANDARD BASE. COLOR: RED	T	EA	$ .83
> 6240005190158	LAMP, FLOURESCENT F40 CW STANDARD, NON-[illegible]	T	EA	$ 1.05
> 6240009892421	LAMP, FLOURESCENT, 75 WATTS, T-12 BULB SINGLE PIN BASE, 525 MA, LENGTH 96" F96T12/CW	T	EA	$ 2.60
624000X8000002	LAMP, FLOURESENT, TUBE, F6T5	T	EA	$ 2.30
> 6240009738237	LAMP, FLUORESCENT, 110 VOLTS, BULB #T12, BASE RECESS DC, MAX OVERALL LENGTH INCHES F96T12/CW/HO HIGH OUTPUT	T	EA	$ 1.94
> 6240002477348	LAMP, FLUORESCENT, 90 WATT, T-12 BULB, COLOR: COOL WHITE, BASE BIPIN (SEE LONG SPECIAL, PRICES ARE F96T12	T	EA	$ 6.99

B-20

8-29

WATE T ARSENAL
SELF-SE SUPPLY CENTER
- MASTER T OF SUPPLIES -
REPAIR & UTILITY

STOCK NUMBER	NOMENCLATURE	MAT-CAT	UNIT ISSUE	UNIT PRICE
>6240007522081	LAMP,FLUORESCENT,POWER GROOVE F96PG17/CW	T	EA	$ 10.15
6240005190445	LAMP,FLUORESCENT,WATTS 32,BULB NO.T-10 BASE,4-PIN,COOL WHITE,RAPID START,12"DIA	T	EA	$ 4.00
6240008200470	LAMP,FLUORESCENT,WATT 14,BULB T-12,MED. BI-PIN BASE,WARM WHITE	T	EA	$ 3.86
>6240000671021	LAMP,FLUORSCENT TUBE, 6FOOT,POWER GROOVE "POWER GROOVE" 1500M.A.165 WATTS RAIPID START F72T12PG	T	EA	$ 4.92
6240006354480	LAMP,INCANDESCENT 60 WATT,120 VOLTS MED. SCREW BASE,INSIDE FROSTED,A-19 BULB	T	EA	$ .38
6240002239097	LAMP,INCANDESCENT CLEAR,1/4 WATT,105-125 VOLT CANDLE BASE	T	EA	$ 4.67
6240001433049	LAMP,INDICATOR,6 WATTS,110 VOLTS, CLEAR G.E. #6S6	T	EA	$ .16
6240001558001	LAMP,INDICATOR,CLEAR,CANDLEABRA BASE 10 WATTS 230 VOLTS, G.E. 1056-10	T	EA	$ 2.26
6240007123090	LAMP,REFLECTOR,INFRE-RED,RED BOWL,250 WATTS,125 VOLTS,OR 120 VOLTS	T	EA	$ 3.08
6240007818372	LAMP,STREET LIGHTING,6000 LUMENEARS BULB 6.6,MOGUL BASE,CLEAR	T	EA	$ 7.50
6240005003643	LAMP,TRAFFIC SIGNAL,CLEAR,60 WATTS,120 VOLTS,BULB A21	T	EA	$ .81
>624000X810003	LAMP,U SHAPED FLU	T	EA	$ 5.88
6240006171713	LAMP,WHITE 7-1/2 WATTS,120 VOLTS	T	EA	$ .85
6250006906155	LAMPHOLDER THREE GANG COVER ONLY	T	EA	$ 1.50
6250002996327	LAMPHOLDER, BRASS, PULLCHAIN, MED. BASE	T	EA	$ 1.50
6250006906165	LAMPHOLDER, FLOODLIGHT, WITHOUT COVER-PLATE	T	EA	$ 2.25

B-30

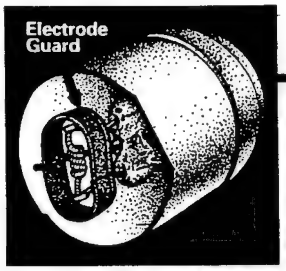
STOCK NUMBER	NOMENCLATURE	MAT-CAT	UNIT ISSUE	UNIT PRICE
473000X879009	ADAPTER,MALE COPPER SWEAT TO PIPE THREAD 1-1/2"	T	EA	$ 1.47
8040002254548	ADHESIVE SEALANT, WHITE SILICONE RUBBER CAULKING, R.T.V.	T	EA	$ 2.29
951000X830002	ALL THREADED ROD, 1/4" X 6' LENGHT	T	EA	$ .63
5975000001985	ANCHOR,SCREW,PLASTIC,1"LONG FOR #12X1" SHEET METAL SCREW	T	EA	$ .03
5340005402270	ANCHOR,WOOD SCREW MULTI SIZE FOR USE WITH #10 TO #14 WOOD SCREW, 1-1/2" LONG	T	EA	$ .06
5975006908890	ANCHOR,WOOD SCREW,MULTI SIZE,FOR USE WITH #10 TO #14 WOOD SCREW,1" LONG, DIAMOND #5316	T	EA	$ .03
8105002811158	BAG,BROWN PAPER 2 LB.	T	PK	$ 3.90
8105005592561	BAG,BROWN PAPER GROCERS TYPE #1	T	BE	$ .15
8105002811163	BAG,GROCERS,35 LB WT,POPULAR WEIGHT,5 LB 500 EACH PACKAGE, 3000 EACH PER BALE	T	PK	$ 3.90
> 6250006906030	BALLAST,118 VOLT,1.55 AMP,G.E.CAT.7G1011 FOR USE WITH LAMP 96T12 OR EQUAL	T	EA	$ 11.76
6250008259422	BALLAST,ADVANCE, 1-14, 15, 20 OR 22 WATT FLOURESCENT, RLQ-120	T	EA	$ 5.86
> 625000X889034	BALLAST,ELECTRONIC,LIGHTING FOR TWO F96/277 VOLT FLOURESCENT LAMPS. SINGLE PIN. MODEL #US-B00SS	T	EA	$ 19.10
> 6250006906125	BALLAST,FOR USE WITH TWO,40 WATT,RAPID START LAMPS IN SERIES (REF.ADVANCE CAT. RQM 2S40) NO SUBSTITUTE	T	EA	$ 7.75
482000X889012	BALLCOCK,FLUIDMASTERR,400A SERIES	T	EA	$ 7.40
5920006915304	BASE,FUSE CUTOUT,SINGLE POLE,FOR TYPE BBS FUSES,600 VOLTS PORCELAIN	T	EA	$ 1.54

8-31

TL 80 Series Fluorescent Lamps
Electrical, Technical and Ordering Data (Subject to change without notice)

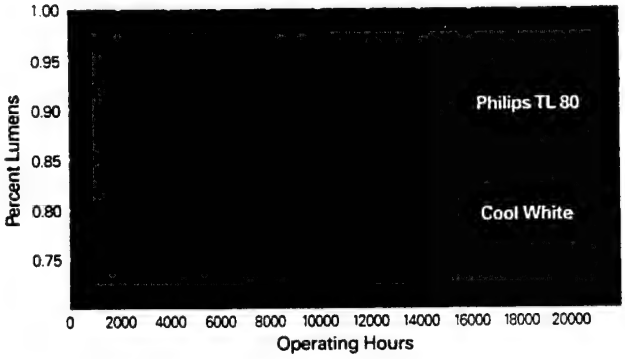
Product Number 046677-	Description	Nominal Watts	Bulb	Base	Std Pkg Qty	Lamp Current (Amps)	Color Temp (Kelvin)	Color Rendering (CRI)	Nominal Length (Feet)	Rated Average Life (Hrs)[1]	Approx. Initial Lumens	Design Lumens[2]
31980-6	F17T8/TL830	17	T-8	Md. Bipin	25	0.265	3000	85	2	20,000	1400	1300
32304-8	F17T8/TL835	17	T-8	Md. Bipin	25	0.265	3500	85	2	20,000	1400	1300
31983-0	F17T8/TL841	17	T-8	Md. Bipin	25	0.265	4100	85	2	20,000	1400	1300
31984-8	F25T8/TL830	25	T-8	Md. Bipin	25	0.265	3000	85	3	20,000	2250	2100
25798-0	F25T8/TL835	25	T-8	Md. Bipin	25	0.265	3500	85	3	20,000	2250	2100
31989-7	F25T8/TL841	25	T-8	Md. Bipin	25	0.265	4100	85	3	20,000	2250	2100
31991-3	F32T8/TL830	32	T-8	Md. Bipin	25	0.265	3000	85	4	20,000	3050	2850
31993-9	F32T8/TL835	32	T-8	Md. Bipin	25	0.265	3500	85	4	20,000	3050	2850
31994-7	F32T8/TL841	32	T-8	Md. Bipin	25	0.265	4100	85	4	20,000	3050	2850
31996-2	F40T8/TL830	40	T-8	Md. Bipin	25	0.265	3000	85	5	20,000	3800	3550
25799-8	F40T8/TL835	40	T-8	Md. Bipin	25	0.265	3500	85	5	20,000	3800	3550
31998-8	F40T8/TL841	40	T-8	Md. Bipin	25	0.265	4100	85	5	20,000	3800	3550

(1) Average life under specified test conditions with lamps turned off and restarted no more than once every 3 operating hours.
(2) Approximate lumens at 40% of rated average life (8000 Hours).



For maximum lumen maintenance, TL 80 Series lamps feature an "electrode guard" around each electrode to effectively reduce lamp darkening and retain a clean appearance for thousands of hours.

Lumen Maintenance: TL 80 vs. Cool White



Philips Lighting specialists are ready to help.

Philips Lighting has a team of specialists dedicated to commercial/office and retail lighting applications. They can provide a free lighting analysis which demonstrates how Philips TL 80 Series lamps can reduce energy costs in your building and improve the quality of light at the same time.

Call your Philips Lighting representative for a free fluorescent lighting analysis today: **1-800-631-1259.**

TL 80 System – lamp specification

"Lamps shall be Philips TL 80 Series lamps having:
- Color rendering index of 85
- T-8 diameter bulb
- Medium bi-pin bases
- Color temperature of _____ K (3000, 3500 or 4100)
- Initial lumens of _____ (1400, 2250, 3050 or 3800)
- Nominal wattage of _____ (17, 25, 32, 40)
- Powered by electronic ballasts designed for 265ma T-8 lamps
- An electrode guard."

SYSTEM PERFORMANCE

Because the 32-watt, T8 lamp would not operate properly on existing forty-watt, 430 ma. ballasts, design of the Octron lamp system was accomplished without the constraints of existing fluorescent systems. The goal was to optimize total system performance to the F40T12 system in a luminaire while reducing wattage significantly. The result is the most efficient full light output energy-saving fluorescent lighting system.

In designing the Octron lamp system, a number of factors did have to be taken into consideration. One was the ballast factor (ratio of light output when operated on commercially-available ballasts as compared to a reference circuit.) The ballast factor of the Octron magnetic ballast was set at nominal .95; rated lumens and lamp wattage were then established.

Other factors considered were the thermal effects, i.e. 2900 rated lumens of the Octron lamp versus the 3050 lumen rating of F40CW lamps, versus the lumen output of the same lamps when operated in a stabilized condition in the luminaire. Then there were the optical effects to be considered, i.e. better lighting control, and the trapping of less light by the fixture walls and bulb itself.

The true metric for comparison of the fluorescent lamps is their actual performance in a lighting system. The data shown in Figure 7 are the result of the systems approach to lamp design taking into consideration all of the above mentioned factors. In these tests, each fluorescent system was operated in the same 4-lamp recessed lensed troffer, in a room ambient temperature of 77°F. The plenum was allowed to stabilize prior to collection of system wattage and relative lumen output data. The F40CW/standard magnetic ballast was used as the base system, and set at 100% Relative Light Output. As Figure 8 illustrates, data were collected concerning watts, Relative Light Output and RLO/watt for each lamp type and ballast tested.

Results show that Octron lamps operated on magnetic ballasts deliver system efficiency equal to T12 34-watt energy-saving lamps operated on electronic ballasts. Furthermore, the tests show that Octron lamps operated on T8 electronic ballasts provide the highest system efficiency — 166 RLO/watt.

(FIGURE 7)

FIXTURE COMPARISON DATA (77° TEST ROOM - 4-LAMP RECESSED TROFFER, PLASTIC LENS)

LAMP TYPE	BALLAST	BALLAST FACTOR[1]	WATTS	RELATIVE LIGHT OUTPUT (RLO)[2]	RLO/W
SYLVANIA F40CW	STD. MAGNETIC	.95	174	100	100
SYLVANIA 34W SUPERSAVER® D841	STD. MAGNETIC	.90	155	95	107
SYLVANIA 32W SUPERSAVER PLUS D841	STD. MAGNETIC	.90	144	93	113
SYLVANIA F40CW	ENERGY SAVING MAGNETIC	.95	162	101	108
SYLVANIA 34W SUPERSAVER D841	ENERGY SAVING MAGNETIC	.88	139	93	116
SYLVANIA 32W SUPERSAVER PLUS D841	ENERGY SAVING MAGNETIC	.88	131	91	122
SYLVANIA 34W SUPERSAVER D841	ELECTRONIC	.75	119	93	136
SYLVANIA FO32 OCTRON®	T8 MAGNETIC	.95	132	104	137
SYLVANIA FO32 OCTRON®[3]	T8 ELECTRONIC	.92	106	101	166

1 DATA IN TEST NORMALIZED TO BALLAST FACTORS SHOWN IN THIS COLUMN FOR MAGNETIC BALLASTS. FACTORS SHOWN FOR ELECTRONIC BALLASTS ARE MEASURED VALUES OF SAMPLE.
2 RELATIVE LIGHT OUTPUT BASED ON INITIAL (100 HOUR) RATED LAMP LUMEN OUTPUT AS OF 8/22/83.
3 LIFE RATED AT 15,000 HOURS. ALL OTHER SYSTEMS SHOWN ARE RATED AT 20,000 HOURS.

8-33

OCTRON CURVALUME LAMPS

An Octron Curvalume family has been introduced to provide greater lighting design, flexibility and higher efficiency than conventional U-lamp systems having T-12 bulbs. These lamps are available in 16-, 24- and 31-watt sizes and are designed to operate on Octron ballasts available for the 2-, 3-, and 4-foot straight lamps respectively. Their medium bipin bases will fit existing sockets designed for ordinary T-12 Curvalume lamps.

The new size of the Octron Curvalume family allows for the design of more compact luminaires for a wide variety of applications. The tight-bend U-lamps have a center to center leg spacing of $1^5/_8$'' and have overall lengths of 10½'' for the 16-watt, 16½'' for the 24-watt and 22½'' for the 31-watt lamps. When operated on rapid start magnetic ballasts, the Octron Curvalume lamps have an average rated life of 20,000 hours.

Available in the three standard Octron colors of 3100K, 3500K and 4100K, these lamps may be used in conjunction with other members of the Octron family to fit the varied requirements of a lighting installation. Octron Curvalume lamps also have a color rendering index of 75, common to other Octron lamp types. Table 2, in this bulletin describes the physical, electrical, and photometric performance data for the Octron Curvalume family of lamps.

OCTRON CURVALUME LAMP COLOR & PERFORMANCE DATA

	FB016 (16 watt)			FB024 (24 watt)		
Ordering Abbreviation	FB016/31K	FB016/35K	FB016/41K	FB024/31K	FB024/35K	FB024/41K
Sylvania Item Number	21801	21800	21802	21803	21810	21804
Correlated Color Temp.	3100K	3500K	4100K	3100K	3500K	4100K
Color Rendering Index	75	75	75	75	75	75
Initial Lumens	1250	1250	1250	2050	2050	2050

	FB031 (31 watt)		
Ordering Abbreviation	FB031/31K	FB031/35K	FB031/41K
Sylvania Item Number	21805	21807	21806
Correlated Color Temp.	3100K	3500K	4100K
Color Rendering Index	75	75	75
Initial Lumens	2800	2800	2800

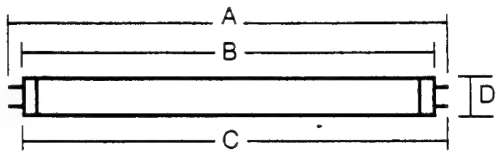
EFFECT OF BURNING PERIODS ON LAMP LIFE

Due to slight variations in the lamp making process, it is impossible to have each lamp operate for exactly the life for which it was designed. For this reason, lamp life is rated as the average life of a large group of lamps, operated under controlled laboratory conditions. Average rated life is the point at which approximately 50 percent of the lamps in a large test group have burned out and 50 percent remain burning as shown in Figure 8.

During the operation of a fluorescent lamp, the emissive material is gradually depleted from the cathodes. The normal end of life is reached when there is insufficient emissive material remaining on either cathode to strike the arc. Since published average rated life figures are based on a three hour burning cycle, these ratings reflect the effects of both starting and operating. Changes in the burning cycle will affect life in service. Shorter burning cycles (more frequent starts) shorten lamp life and extended burning cycles (less frequent starts) increase lamp life. Figure 9 lists the average life in hours for Octron fluorescent lamps at various burning cycles. Data is provided for Octron lamps operated at 60Hz. in the rapid start mode as well as for high frequency operation in the instant start mode.

8-34

STRAIGHT OCTRON PERFORMANCE DATA



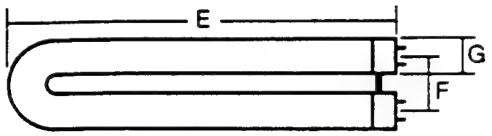
(TABLE I)

	F017		F025		F032		F040	
I. Physical Characteristics	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
Overall Length (A)	23.67″	23.78″	35.67″	35.78″	47.67″	47.78″	59.50″	59.61″
Face to Face (B)		23.22″		35.22″		47.22″		59.05″
Face to End of Opposite Pin (C)	23.41″	23.50″	35.41″	35.50″	47.41″	47.50″	59.24″	59.33″
Bulb Diameter (D)	.94″	1.1″	.94″	1.10″	.94″	1.10″	.94″	1.10″
Base Type	medium bipin		medium bipin		medium bipin		medium bipin	
II. Electrical Characteristics 60 Hz Rapid Start								
Lamp								
Rated Power	17 watts		25 watts		32 watts		40 watts	
Lumens per Watt	79 LPW		86 LPW		90.6 LPW		91.3 LPW	
Lamp Current	265 ma.		265 ma.		265 ma.		265 ma.	
Lamp Voltage	73 v.		106 v.		139 v.		172 v.	
Lamp Life (3 hrs./start)	20,000 hrs.		20,000 hrs.		20,000 hrs.		20,000 hrs.	
Ballast Requirements (2-lamp)								
Starting Time	0.75-2.0 sec.		0.75-2.0 sec.		0.75-2.0 sec.		0.75-2.0 sec.	
Open Circuit Voltage[1]	210		260		300		385	
Starting Aid Voltage[1] (peak)	350		350		290		350	
Filament Voltage[1]								
Dummy Load (11 ohms)	3.4-4.5 v.		3.4-4.5 v.		3.4-4.5 v.		3.4-4.5 v.	
Operational	2.5-4.0 v.		2.5-4.0 v.		2.5-4.3 v.		2.5-4.0 v.	
Lamp Current Crest Factor	1.7 max.		1.7 max.		1.7 max.		1.7 max.	
III. Electrical Characteristics 25 KHz Instant Start								
Lamp								
Rated Power	14 watts		21 watts		28 watts		35 watts	
Lumens per Watt	97 LPW		102 LPW		103.6 LPW		104 LPW	
Lamp Current	210 ma.		210 ma.		210 ma.		210 ma.	
Lamp Voltage	66 v.		101 v.		136 v.		172 v.	
Lamp Life (3 hrs./start)	15,000 hrs.		15,000 hrs.		15,000 hrs.		15,000 hrs.	
Ballast Requirements								
Open Circuit Voltage	425 v. min.[4]		425 v. min.[4]		500 v. min.[4]		575 v. min.[4]	
Starting Time	50 ms. max.		50 ms. max.		50 ms. max.		50 ms. max.	
Current Crest Factor	1.7 max.		1.7 max.		1.7 max.		1.7 max.	
IV. Photometric Characteristics								
Ordering Abbreviation	F017/31K	F017/41K	F025/31K	F025/41K	F032/31K	F032/41K	F040/31K	F040/41K
Sylvania Item Number	21830	21831	21828	21829	21825	21824	21826	21827
Correlated Color Temp.	3100K	4100K	3100K	4100K	3100K	4100K	3100K	4100K
Color Rendering Index	75	75	75	75	75	75	75	75
Initial Lumens	1350	1350	2150	2150	2900	2900	3650	3650
Mean Lumens (8000 Hrs)[2]	1215	1215	1935	1935	2600	2600	3285	3285
Mean Lumens (6000 Hrs)[3]	1235	1235	1965	1965	2650	2650	3335	3335

1. For Starting at 50° F and above
2. Mean Lumens at 40% of 20,000 Hr rated Life—Rapid Start Operation
3. Mean Lumens at 40% of 15,000 Hr rated Life—Instant Start Operation—High Frequency
4. Single lamp requirement

8-35

OCTRON CURVALUME PERFORMANCE DATA



(TABLE II)

	FB016		FB024		FB031	
I. Physical Characteristics	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
Base face to Outside of glass bend (E)	10.25″	10.60″	16.25″	16.60″	22.25″	22.60″
Center to Center of bases (F)	1.50″	1.75″	1.50″	1.75″	1.50″	1.75″
Bulb Diameter (G)	.94″	1.10″	.94″	1.10″	.94″	1.10″
Base Type	medium bipin		medium bipin		medium bipin	
II. Electrical Characteristics						
60 Hz Rapid Start						
Lamp						
Rated Power	16 watts		24 watts		31 watts	
Lumens per Watt	78 LPW		85 LPW		90 LPW	
Lamp Current	265 ma.		265 ma.		265 ma.	
Lamp Voltage	67 v.		100 v.		133 v.	
Lamp Life (3 hrs./start)	20,000 hrs.		20,000 hrs.		20,000 hrs.	
Ballast Requirements (2-lamp)						
Starting Time	.75-2.0 sec.		.75-2.0 sec.		.75-2.0 sec.	
Open Circuit Voltage[1]	210		260		300	
Starting Aid Voltage[1] (peak)	350		350		290	
Filament Voltage[1]						
Dummy Load (11 ohms)	3.4-4.5 v.		3.4-4.5 v.		3.4-4.5 v.	
Operational	2.5-4.0 v.		2.5-4.0 v.		2.5-4.0 v.	
Lamp Current Crest Factor	1.7 max.		1.7 max.		1.7 max.	
III. Electrical Characteristics						
25 KHz Instant Start						
Lamp						
Rated Power	13 watts		20 watts		27 watts	
Lumens per Watt	97 LPW		102 LPW		104 LPW	
Lamp Current	210 ma.		210 ma.		210 ma.	
Lamp Voltage	61 v.		96 v.		131 v.	
Lamp Life (3 hrs./start)	15,000 hrs.		15,000 hrs.		15,000 hrs.	
Ballast Requirements						
Open Circuit Voltage	425 v. min.[4]		500 v. min.[4]		575 v. min.[4]	
Starting Time	50 ms. max.		50 ms. max.		50 ms. max.	
Current Crest Factor	1.7 max.		1.7 max.		1.7 max.	
IV. Photometric Characteristics						
Ordering Abbreviation	FB016/31K	FB016/41K	FB024/31K	FB024/41K	FB031/31K	FB031/41K
Sylvania Item Number	21801	21802	21803	21804	21805	21806
Correlated Color Temp.	3100K	4100K	3100K	4100K	3100K	4100K
Color Rendering Index	75	75	75	75	75	75
Initial Lumens	1250	1250	2050	2050	2800	2800
Mean Lumens (8000 Hrs)[2]	1125	1125	1845	1845	2520	2520
Mean Lumens (6000 Hrs)[3]						

1. For Starting at 50° F and above
2. Mean Lumens at 40% of 20,000 Hr rated Life—Rapid Start Operation
3. Mean Lumens at 40% of 15,000 Hr rated Life—Instant Start Operation—High Frequency
4. Single lamp requirement

Sales Offices

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New York, New York 10017
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Danvers, MA 01923 508-777-1900

O-362.0390

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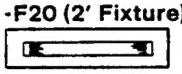
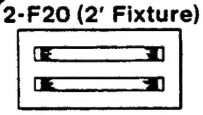
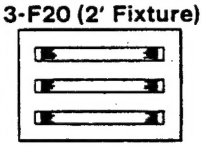
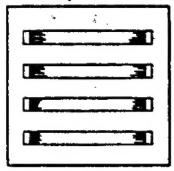
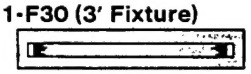
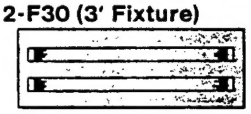
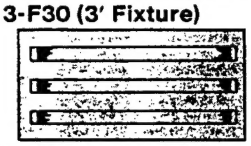
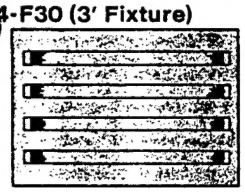
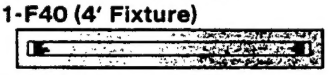
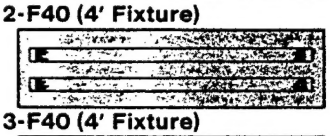
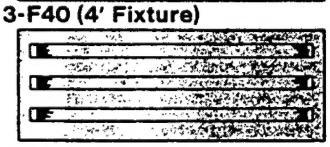
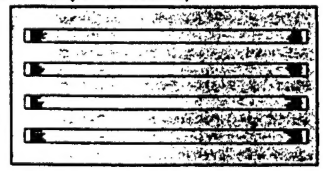
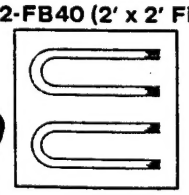
THE POWER IS ON

SYLVANIA LIGHTING SERVICES FIXTURE CONVERSION DATA

Fixtures that are "Convertible" to the Octron System	Typical Wattages after Conversion to Octron System	Typical Pre-Conversion T12 System Wattages[1]	Estimated Change in Fixture Wattage with Conversion[2]	Estimated Change in Light Output with Conversion[3]
1-F20 (2' Fixture) 	24 Watts w/Mag Ballast	32 Watts w/Std lamp	Down 25%	Up 7 – 10%
2-F20 (2' Fixture) 	43 Watts w/Mag Ballast	50 Watts w/Std lamps	Down 14%	Up 7 – 10%
3-F20 (2' Fixture) 	51 Watts w/Elec Ballasts (67 Watts w/Mag Ballast)	82 Watts w/Std lamps	Down 38%	Up 7 – 10%
4-F20 (2' Fixture) 	57 Watts w/Elec Ballast (86 Watts w/Mag Ballasts)	100 Watts w/Std lamps	Down 43%	Up 7 – 10%
1-F30 (3' Fixture) 	29 Watts w/Mag Ballast	43 Watts w/Std lamp 36 Watts w/SS lamp	Down 33% Down 20%	No Change Up 7 – 10%
2-F30 (3' Fixture) 	48 Watts w/Elec Ballast (55 Watts w/Mag Ballast)	75 Watts w/Std lamps 61 Watts w/SS lamps	Down 36% Down 21%	No Change Up 7 – 10%
3-F30 (3' Fixture) 	64 Watts w/Elec Ballast (84 Watts w/Mag Ballasts)	118 Watts w/Std lamps 97 Watts w/SS lamps	Down 46% Down 34%	No Change Up 7 – 10%
4-F30 (3' Fixture) 	84 Watts w/Elec Ballast (110 Watts w/Mag Ballasts)	150 Watts w/Std lamps 122 Watts w/SS lamps	Down 44% Down 31%	No Change Up 7 – 10%
1-F40 (4' Fixture) 	35 Watts w/Mag Ballast	55 Watts w/Std lamp 48 Watts w/SS lamp	Down 36% Down 27%	No Change Up 10 – 14%
2-F40 (4' Fixture) 	62 Watts w/Elec Ballast (67 Watts w/Mag Ballast)	92 Watts w/Std lamps 78 Watts w/SS lamps	Down 33% Down 21%	No Change Up 10 – 14%
3-F40 (4' Fixture) 	84 Watts w/Elec Ballast (102 Watts w/Mag Ballasts)	147 Watts w/Std lamps 126 Watts w/SS lamps	Down 43% Down 33%	No Change Up 10 – 14%
4-F40 (4' Fixture) 	106 Watts w/Elec Ballast (133 Watts w/Mag Ballasts)	174 Watts w/Std lamps 156 Watts w/SS lamps	Down 39% Down 32%	No Change Up 10 – 14%
2-FB40 (2' x 2' Fixture) 	60 Watts w/Elec Ballast (65 Watts w/Mag Ballast)	92 Watts w/Std lamps 78 Watts w/SS lamps	Down 35% Down 23%	No Change Up 10 – 14%

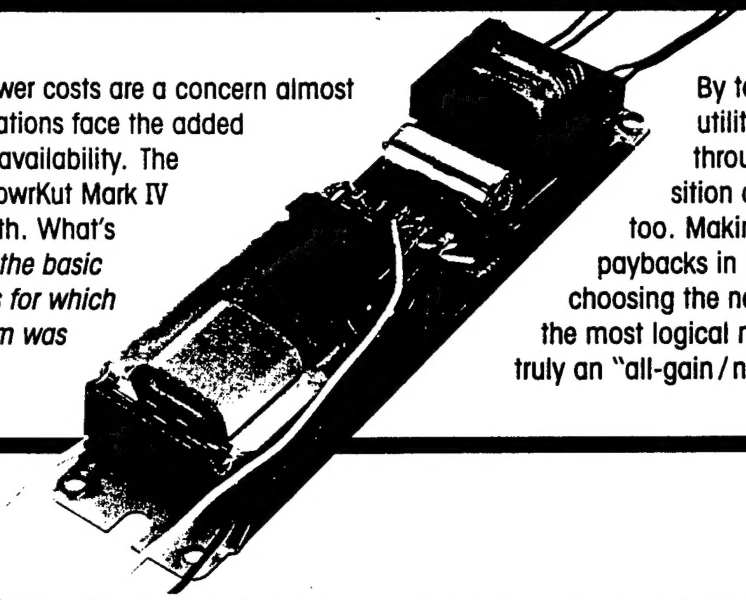
NOTES:

1. Estimate is based on fixtures with Standard Magnetic Ballasts
2. Compared to lowest wattage Octron system
3. Assumes same age of both old & new systems (4100K vs. CW). Does not consider immediate light level improvement provided by relamping.

SYLVANIA Lighting Services GTE

A Solid Choice for Many Applications

Rapidly rising electrical power costs are a concern almost everywhere. And some locations face the added problem of limited power availability. The energy-saving ADVANCE PowrKut Mark IV ballast is an answer for both. What's more, it lets you *maintain the basic lighting performance levels for which your present lighting system was originally designed.*

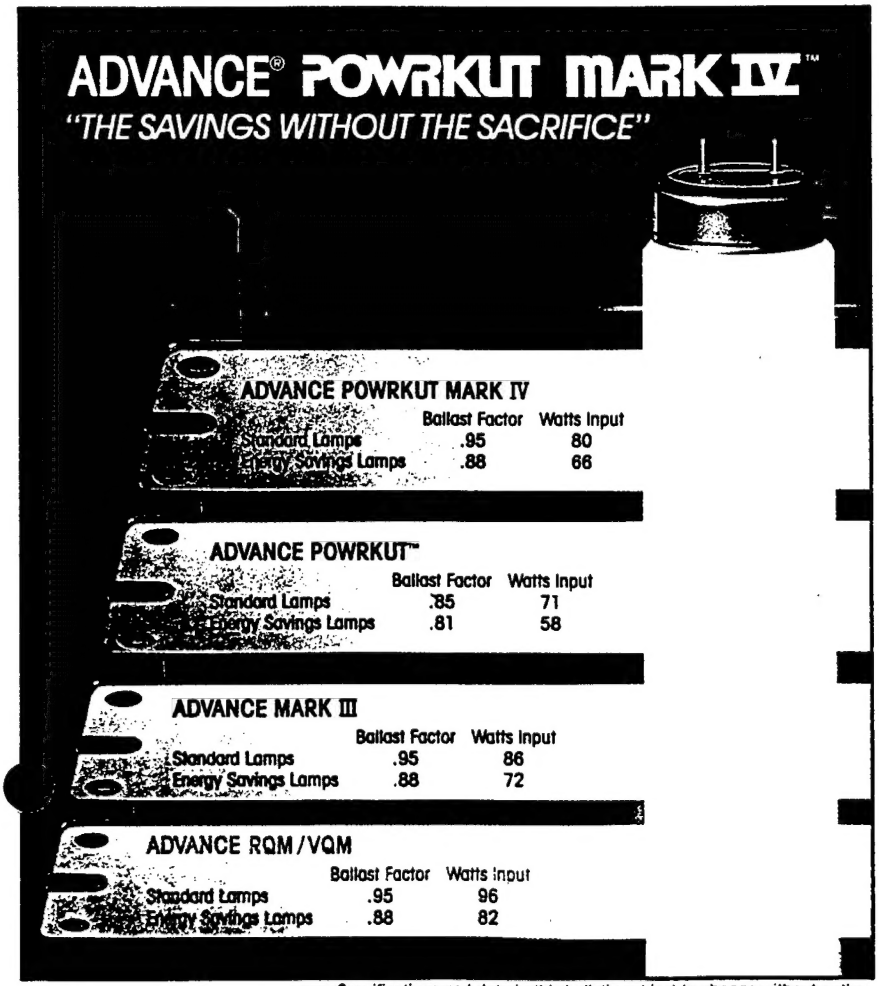


By taking advantage of the extensive utility rebate programs available throughout many areas, your acquisition cost may be greatly reduced, too. Making for one of the fastest overall paybacks in ballasting today. Indeed, choosing the new PowrKut Mark IV may be the most logical move you've ever made—it's truly an "all-gain/no-pain" proposition.

ADVANCE® PowrKut Mark IV™ Ballast for Two 4-ft. F-40 Rapid Start Lamps—60 Hz

Lamp Data		Min. Starting Temp. (°F)	Ballast Input Watts	Line Current (Amps)	Circuit (Volts)	Catalog Number (Class P)	Ballast Efficacy Factor	Sound Rating	Dimensions (Inches)				No. of Units Per Std. Ctn.	Wt. Std. Ctn. (Lbs.)
Description	Nom. Watts								Length	Width	Height	Mounting		
(2) F40 (2) F40/U Energy Savers	34	60°	66	.57 .26	120 277	RK-2S40-TP(E) VK-2S40-TP(E)	1.33						10	38
(2) F40T12, (2) F40T10, (2) FB40T12	40	50°	80	.69 .31	120 277	RK-2S40-TP(E) VK-2S40-TP(E)	1.16							

ETL verification of performance to specifications in ETL Procedure B30.0 with test methods per ANSI Standard C82.2.



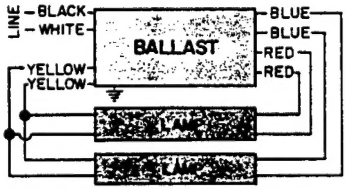
Specifications and data in this bulletin subject to change without notice.

Specifications—ADVANCE PowrKut Mark IV Hybrid Electromagnetic Ballast

The ballast shall be ADVANCE PowrKut Mark IV hybrid electromagnetic design incorporating special circuitry to cut off cathode voltage to lamp filaments after the lamps are lit. It shall have an average input of 80 watts when operating 2, F40T12 (40W) rapid start lamps with ballast factor of .95 and average input of 66 watts when operating 2, F40T12 (34W) energy saving rapid start lamps with ballast factor of .88. Performance verified by ETL Laboratories to specifications in ETL Procedural Guide B30.0, using Test Methods of ANSI C82.2.

When operating 2, F40T12 (40W) rapid start lamps, Ballast Efficacy Factor (B.E.F.) shall meet or exceed 1.16; lamp current crest factor shall not exceed 1.6. Ballast shall have a 3-year warranty; design shall provide full rated 20,000 hour lamp life.

Wiring Diagram



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A DIVISION OF NORTH AMERICAN PHILIPS CORPORATION

Form No. 1516 Printed in U.S.A.

EBT LOW HARMONIC BALLAST GUIDE

RAPID START BALLAST (SERIES CONNECTION)

LAMPS	LAMP TYPE	LAMP LENGTH	LAMP WATTS	INPUT VOLTAGE	LINE AMPS	INPUT WATTS	ORDERING CODE
1 ***	F40T12/RS	4'	34	120	0.27	31	SSB1-120-1/40 LH
			40		0.33	38	
			34	277	0.12	31	SSB1-277-1/40 LH
			40		0.14	38	
2 ***	F40T12/RS	4'	34	120	0.50	59	SSB1-120-2/40 LH
			40		0.60	71	
			34	277	0.22	59	SSB1-277-2/40 LH
			40		0.26	71	
3 ***	F40T12/RS	4'	34	120	0.77	90	SSB1-120-3/40 LH
			40		0.89	105	
			34	277	0.33	90	SSB1-277-3/40 LH
			40		0.39	105	
2 ****	F96T12/HO	8'	95	120	1.36	160	SSB1-120-2/96 HO LH
			110		1.62	190	
			95	277	0.59	160	SSB1-277-2/96 HO LH
			110		0.70	190	

INSTANT START BALLAST (PARALLEL CONNECTION)

1 *	FO32T8	4'	32	120	0.26	30	SSB2-120-1/32 IS LH
				277	0.11	30	SSB2-277-1/32 IS LH
2 *	FO32T8	4'	32	120	0.49	58	SSB2-120-2/32 IS LH
**	FO40T8	4'	40		0.59	70	
	FO32T8	4'	32	277	0.21	58	SSB2-277-2/32 IS LH
	FO40T8	4'	40		0.26	70	
3 * **	FO32T8	4'	32	120	0.75	88	SSB2-120-3/32 IS LH
	FO32T8	4'	32	277	0.32	88	SSB2-277-3/32 IS LH
2 *****	F96T12/IS	8'	60	120	0.89	105	SSB2-120-2/96 IS LH
			75		1.11	130	
			60	277	0.39	105	SSB2-277-2/96 IS LH
			75		0.48	130	
2	40W (TWIN TUBE)	22.5"	40	120	0.56	65	SSB2-120-2/40 IS LH
		22.5"	40	277	0.24	65	SSB2-277-2/40 IS LH

* ALSO COMPATIBLE WITH FO25T8 LAMPS
** ALSO COMPATIBLE WITH FO40T8 LAMPS
*** ALSO COMPATIBLE WITH F30T12, OR F25T12 LAMPS
**** ALSO COMPATIBLE WITH F72T12/HO OR F84T12/HO LAMPS
***** ALSO COMPATIBLE WITH F60T12, F70T12 OR F84T12 LAMPS

EBT SPECIAL PRODUCT GUIDE

LAMPS	LAMP TYPE	LAMP LENGTH	LAMP WATTS	INPUT VOLTAGE	LINE AMPS	INPUT WATTS	ORDERING CODE
2 *	F40T12/RS	4'	34	120	0.53	59	SSB1-120-2/40 MINI
			40		0.64	71	
			34	277	0.23	59	SSB1-277-2/40 MINI
			40		0.28	71	
2 **	F032T8/RS	4'	32	120	0.58	64	SSB1-120-2/32 MINI
			32	277	0.25	64	SSB1-277-2/32 MINI
2 **	F032T8/RS	4'	32	120	0.53	62	SSB1-120-2/32 LH
			32	277	0.23	62	SSB1-277-2/32 LH
3	F032T8/RS	4'	32	120	0.80	94	SSB1-120-3/32 LH
			32	277	0.35	94	SSB1-277-3/32 LH
2	F017T8/RS	2'	17	120	0.29	34	SSB2-120-2/17 IS
			17	277	0.12	34	SSB2-277-2/17 IS
2 *	F40T12/RS	4'	34	120	0.60	71	SSB1-120-2/40MPX LH
			40		0.73	86	
			34	277	0.26	71	SSB1-277-2/40MPX LH
			40		0.32	86	
2 *	F40T12/RS	4'	34	120	0.56	66	SSB1-120-2/40 LH 100%
			40		0.68	80	
			34	277	0.24	66	SSB1-277-2/40 LH 100%
			40		0.29	80	

* ALSO COMPATIBLE WITH F40T12/32W, F30T12, F25T12, 3" AND 6" "U" TUBE LAMPS

** ALSO COMPATIBLE WITH F025T8, F032T8 LAMPS

The ballast total harmonic distortion level may not be less than 20% when used with the above compatible lamps.